C-dash

USER GUIDE

C-dash User Guide

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Introduction

Welcome to the Pi C-dash User Guide. This User Guide is the core documentation for the installation and use of Pi C-dash.

This User Guide has been divided into the following sections to help you become familiar with the C-dash quickly and easily:

Overview
Installation Notes
Setup
Using C-dash
At the track
Troubleshooting
Appendices
Index

If a C-dash has already been fitted to your car, you can get a general idea of the features available within each operating mode (Race mode, Telltale mode, etc.) by looking at the *Overview* section. A summary of how a C-dash is likely to be used in practice is given in the section *At the track*.

If you are installing a C-dash yourself, you will need to follow the instructions given in the *Installation Notes* section before proceeding.

Overview

This section gives an overview of the C-dash, its features and modes.

Read this section before you use the C-dash as an engineer or driver. You will also find it useful to refer to it at the beginning of each race, until you are thoroughly familiar with the C-dash.

The C-dash is a digital dash which can be used to display directly the data from a number of sensors. It can also be used to display data from a Pi System 1 or a Pi System 3 Club.

The following options are available:

- Wheel speed sensor
- RPM box
- Temperature sensors
- Pressure sensors
- Installation kit
- External warning light
- Beacon kit
- Adapter looms to allow a C-dash to be used with a Pi System 1.

The C-dash

The C-dash has a number of fields which can display the following parameters:

- Speed
- RPM
- Lap times (Beacon kit required)
- Oil temperature
- Coolant temperature
- Oil pressure
- Fuel pressure.

The dash also has four coloured LEDs on the front panel as gear-change lights that come on in sequence to indicate when a gear change should be made, an RPM redline alarm light, a 7-segment LED that displays the page identification letter (or gear number if set up), and four alarm lights that light if the temperature and pressure values exceed preset alarm thresholds.

The Beacon kit

The Beacon kit provides the following benefits:

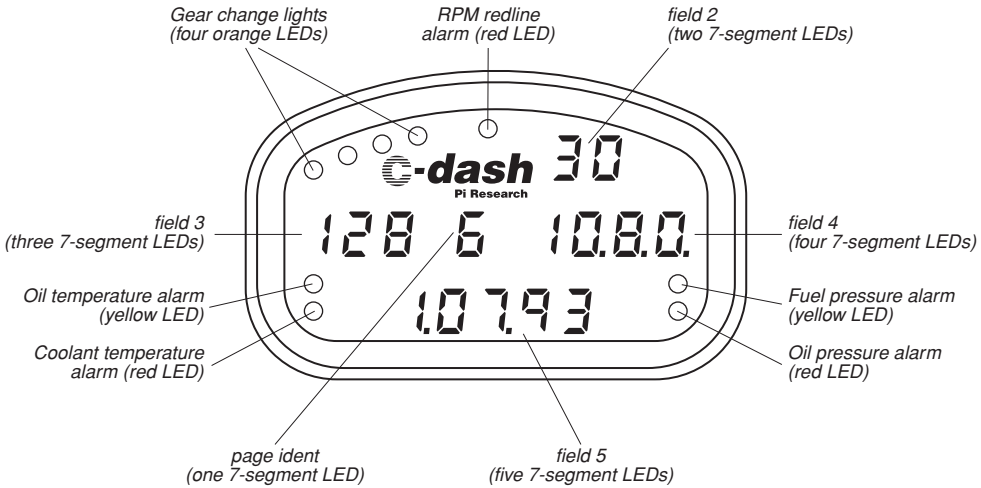
- Fixed lap times or elapsed stage times
- Lap counter
- Lap time telltales.

The Beacon kit allows an accurate registration of each lap passed. The kit consists of an infrared detector mounted on the vehicle and an infrared transmitter mounted on the pit wall.

As the vehicle passes the transmitter, the infrared signal is picked up by the detector on the vehicle. The dash immediately displays the lap time for the driver.

As well as displaying the time and count for each lap, the Beacon kit enables the C-dash to store and display the maximum/minimum readings for each of the sensors per lap (the telltales).

Conventions



C-dash display fields

Display field use

The following table details what data is shown in the fields on the display Pages.

	Realtime A	Realtime B	Race	Telltales C	Telltales D	Telltales E
Field 2	Wheelspeed	Wheelspeed	Lap number	Lap number	Lap number	Lap number
Field 3	Coolant temp	Oil temp	Latched min. speed	Min speed	Max cool temp	Max oil temp
Field 4	Oil press	Fuel press	Realtime speed*	Max speed	Min oil press	Min fuel press
Field 5	RPM	Battery volts	Lap time	Lap time	Max RPM	Min battery V
Ident	Letter A	Letter B	Letter r**	Letter C	Letter D	Letter E

* Realtime speed can be Latched maximum speed . **Letter r can be replaced by gear number.

Remote button functions

BUTTON PRESS	*TIME (seconds)*	*EXAMPLE*
	0 0.5 1 1.5 2	
Click		*Click* CHANNEL *to cycle through Pages in Real-time mode*
Press and Hold		*Press and Hold both* CHANNEL *and* MODE/LAP *to enter Setup mode*

C-dash modes

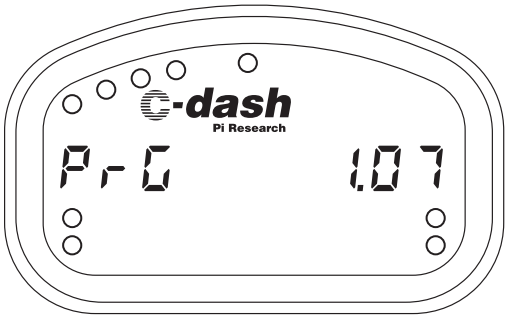
The C-dash automatically switches into one of four different operating modes depending on whether the vehicle is stationary, is being driven, or has just returned from an outing. These operating modes are:

- Power up mode
- Realtime mode
- Race mode
- Telltale mode.

In addition to the four normal operating modes, a Setup mode exists for you to adjust alarm thresholds (e.g. for low oil pressure or high oil temperature), the RPM red line setting and other parameters.

The word *Page* is used to describe a single screen display on the C-dash. Each Page is identified by a letter displayed in the page ident field.

Power up mode



When power is first switched on, the C-dash performs a selftest. After the selftest has finished, information on the version of the software installed is displayed for about three seconds.

You should make a note of the version number displayed on your C-dash and have it ready if you ever need technical support.

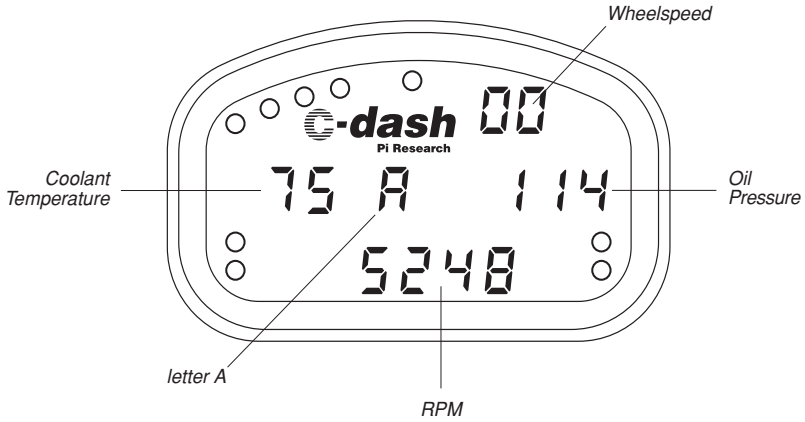
Realtime mode

After power has been applied, the C-dash goes into Realtime Page A and remains there until the vehicle is driven. As the name suggests, Realtime mode is used to show the readings of the sensors on the vehicle in real time (i.e. continuously), as they happen.

The two Pages in Realtime mode display the information shown below.

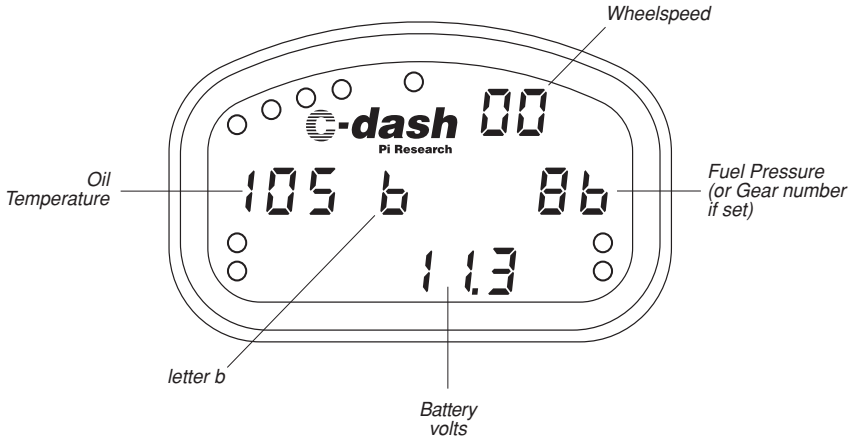
Realtime Page A

Parameter	Field
Wheelspeed	2
Coolant Temperature	3
Oil Pressure	4
RPM	5
Letter A	Page ident



Realtime Page B

Parameter	Field
Wheelspeed	2
Oil Temperature	3
Fuel Pressure (or gear number if set)	4
Battery volts	5
Letter b	Page ident

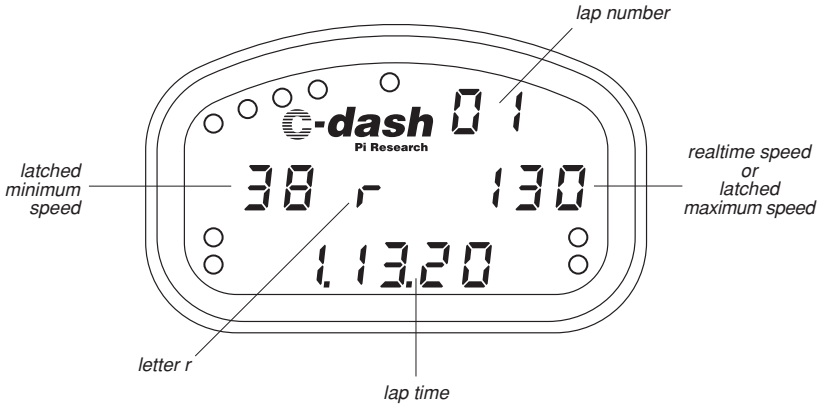


Race mode

The C-dash enters Race mode when the vehicle exceeds its minimum Out speed, for example 40mph, and it automatically switches to Race page (Page r). Latched maximum speed can be displayed instead of Realtime speed by selecting the Latched option in Setup. If gear number options have been set, the letter **r** in the page ident field is replaced by the gear number.

Race Page

Parameter	Field
Lap number	2
Latched minimum speed	3
Realtime speed or Latched maximum speed	4
Laptime	5
Letter r (or gear number)	Page ident



Telltale mode

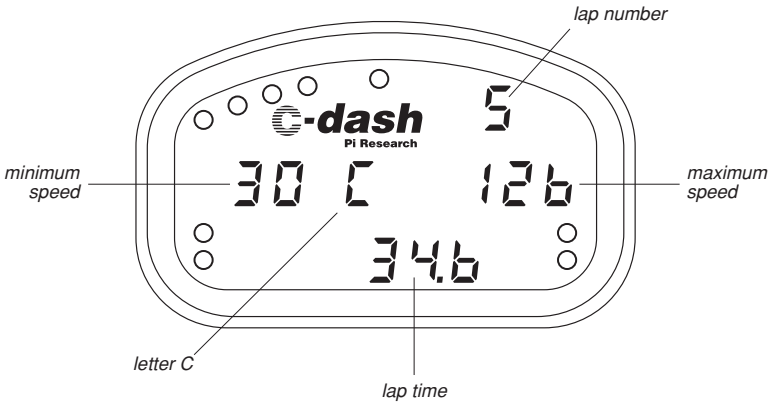
When you return to the pits after driving the vehicle around the track and you have stopped and turned the engine off, the C-dash switches to Telltale mode to show you important information about the outing you've just completed.

NOTE: If you remove power from the C-dash, ALL Telltale data will be lost.

In Telltale mode, three Telltale Pages display the following information.

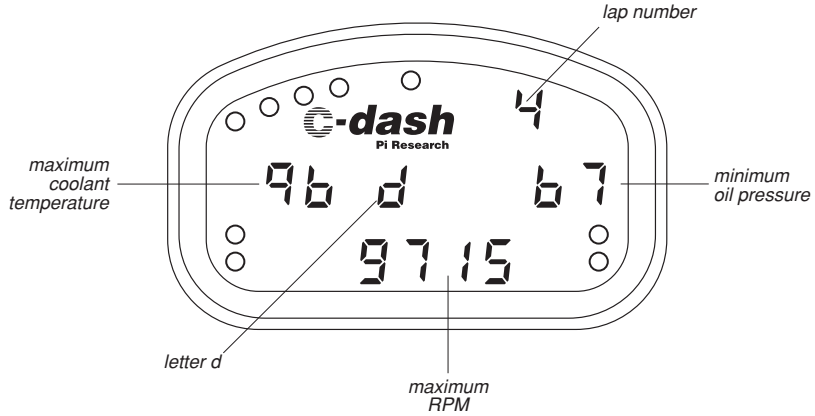
Telltale Page C

Parameter	Field
Lap number	2
Minimum speed	3
Maximum speed	4
Lap time	5
Letter C	page ident



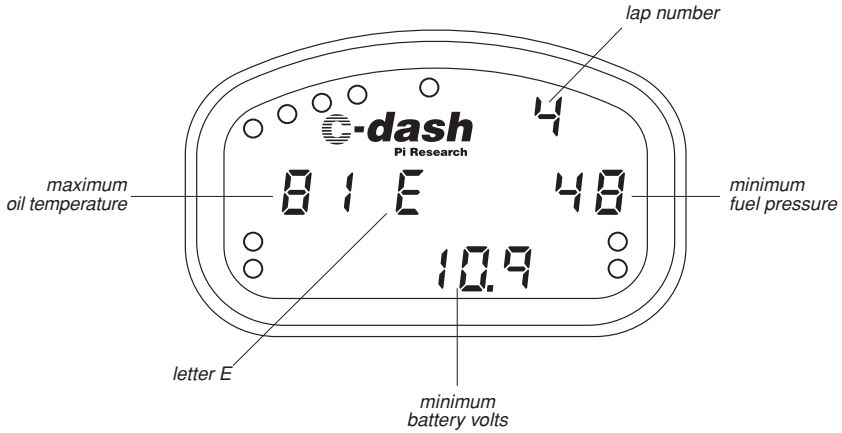
Telltale Page D

Parameter	Field
Lap number	2
Maximum coolant temperature	3
Minimum oil pressure	4
Maximum RPM	5
Letter d	page ident



Telltale Page E

Parameter	Field
Lap number	2
Maximum oil temperature	3
Minimum fuel pressure	4
Minimum battery volts	5
Letter E	page ident



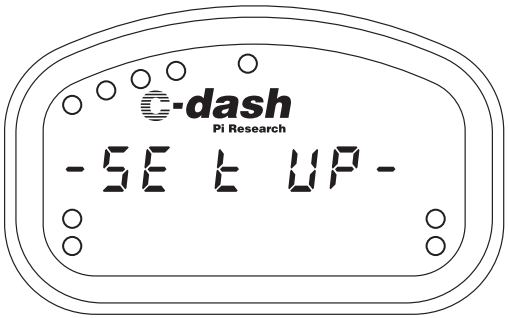
Setup mode

The C-dash is preprogrammed with default settings, but it may be necessary to alter these values to suit your vehicle.

Some of these parameters only need to be set once when the C-dash is installed. However, you may wish to adjust parameters such as the RPM over-rev light or the battery voltage alarm level more frequently.

Details of how to setup the C-dash are given in the 'Setup' section of this guide, together with a list of the parameters you change.

Setup page



Installation Notes

The Installation Notes section covers the installation procedure for the C-dash.

The installation kit

The C-dash comes complete with an installation kit which includes all the connectors, tools and components you will need:

Quantity	Description
3	3-way Sure-Seal socket connectors (Wheelspeed, RPM, Beacon)
2	2-way Sure-Seal socket connectors (for temperatures)
1	3-way Sure-Seal plug connector (for tacho RPM inputs)
11	Sure-Seal socket crimps
17	Sure-Seal pin crimps
4	8mm crimp terminals (for power connections)
3	Female spade connectors (for 0—40 psi pressure sensors)
4	4mm ring tag connectors (for 0—200 psi pressure sensor)
6m	3mm spiralwrap
6m	6mm spiralwrap
2	M3 brass nuts
2	Shakeproof washers
1	Sure-Seal insertion tool
1	Sure-Seal crimp tool
1	Tube silicone sealant

Part A : Fitting the dash and sensors

Wiring notes

The wire used in the C-dash is abrasion resistant and rated to 150°C.

The spiralwrap is rated –10°C to +120°C and is used to further protect the wiring and keep it in a neat bundle. When a bundle passes through a sheet metal bulkhead, make sure that there is no risk of the edge cutting into the bundle.

Cables should not be run next to sources of interference, i.e. ignition coils, plug leads, alternators, fuel pumps, radios and ECUs. If it is absolutely necessary to run the cables near any of these, avoid parallel runs if at all possible.

Care should be taken in the routing of the cables around the engine or brake areas, as localised heating when the vehicle is stationary can cause damage to the wiring.

All vehicles should be wired for the Beacon kit.

If your vehicle does not have fuel injection, you should coil up the wiring for the fuel pressure sensor behind the dash. The wiring may be used for gear position. If it is not used at all, insulate the ends of the wires, or fit a connector socket.

Wiring colour codes

The wires in the loom are colour coded: black for ground, red for power and a different colour for signal. However, this does not mean that all black or red wires are the same.

To avoid any problems, the C-dash unit should be treated as a separate system and only connected to the vehicle at the battery and Master switch. It should not share its wiring with other systems or items on the vehicle.

Power supply

On racing cars, the negative side of the supply battery is conventionally connected to the vehicle chassis through a Master switch. This allows total disconnection of all electrical power in an emergency, and is required by the regulations governing all motor sports.

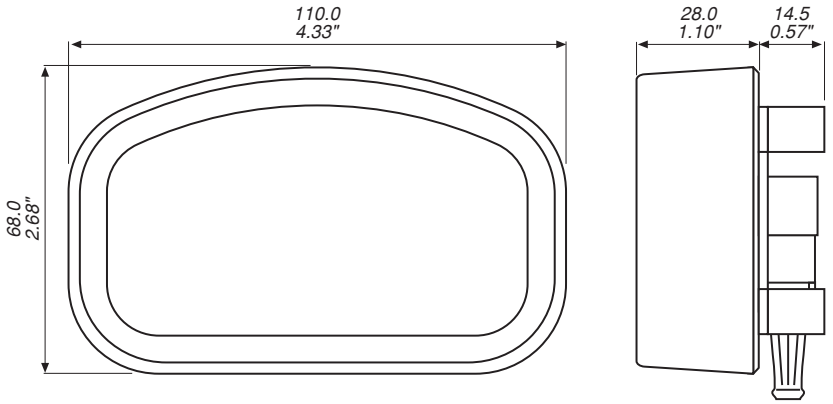
The C-dash should be connected directly to the 'safe' side of the Master switch, to ensure the safety of the installation. The positive supply to the display should be fed directly from the battery 'live' terminal, or optionally through a separate switch, which allows the display to remain powered up while the ignition systems are off.

You can also power the C-dash from a separate 12 volt battery when using it, for instance, on a kart.

Mounting the C-dash

Use the following diagrams when mounting the C-dash.

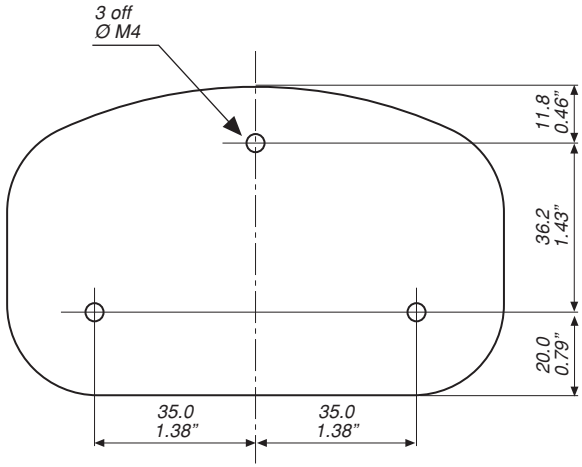
C-dash dimensions



C-dash dimensions in millimetres and inches

You can either adapt your vehicle's existing dash panel, or make up a new one specifically for the C-dash.

1 Remove any existing displays from the vehicle.
2 Check the clearance available behind the dash, to make sure there is room for the C-dash loom and connectors.

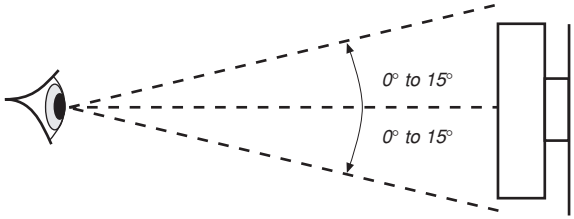


C-dash mounting holes (dimensions in millimetres and inches)

3 Mark up the dash panel with the location of the three mounting holes as shown in the above figure.
4 Drill the location holes.
5 Mount the dash on the panel using the three anti-vibration mounts and screws provided.

Notes

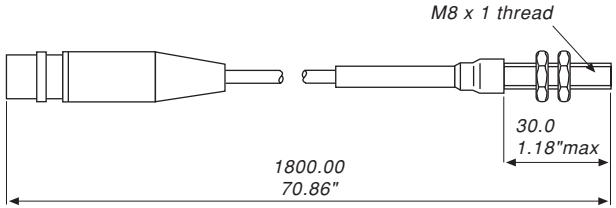
- The C-dash must be electrically and mechanically isolated from the chassis. Use the anti-vibration mounts supplied.
- Make sure that there is space behind the dash panel for the cables to exit.
- Do not bend the looms so that they place a strain on the connectors.
- Fit the remote buttons so that the driver can easily reach them, but they so that they cannot accidentally be knocked.
- The C-dash should be mounted so that the driver can see the display through the steering wheel.
- The driver should look straight at the display. A filter on the C-dash screen restricts the view of the display to ±15° from the horizontal.



Dash viewing angles

Wheelspeed measurement

Wheelspeed sensor



Wheelspeed Sensor		
Sensing Distance	0.4mm to 0.8mm	
Clearance Distance	8mm from any steel object	
Mounting	30mm of M8 x 1 thread	
	(DO NOT OVER-TIGHTEN)	
Connector	3-pin Cannon Sure-Seal	
Sensor connections	Pin 1 (Blue)	Ground
	Pin 2 (Black)	Signal
	Pin 3 (Brown)	Power

Failure to have the minimum clearance from other steel objects causes the sensor to register a rotation even though the trigger target has moved out of range. On the other hand, if the working distance is too great, the sensor will miss triggers, especially at slow speeds.

WARNING: The sensor should only be tightened with a small spanner. Over-tightening the sensor will cause it to fracture.

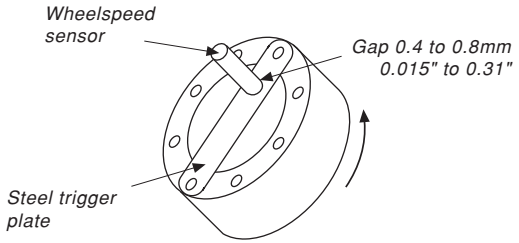
Wheelspeed Trigger	
Type	ferrous metal object
Number	1 to 30 per wheel revolution (typically 2 or 4)
Size	nominally 8 x 8 x 4mm

The trigger used to activate the wheelspeed sensor should have a surface approximately the same size as the head of the sensor, and be at least 4mm away from other metal objects.

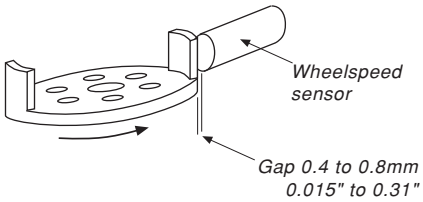
On saloon cars, tolerances of 0.5mm can be hard to achieve so we suggest you use only one trigger.

The sensor can either be mounted in a threaded block, or with a sheet metal bracket. Make sure the sensor does not vibrate or touch the trigger when the vehicle is driven.

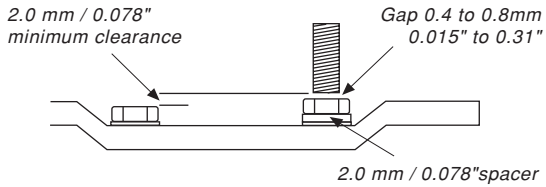
The C-dash can be used with a wide variety of vehicles, so the details of mounting the sensor will vary (installation data sheets for each type are available from Pi Research). Three examples of mounting configurations are shown in the following diagrams.



Top mounted configuration



Side mounted configuration



Wheel stud mounted configuration

Wheelspeed sensors

1 Make a bracket for the wheelspeed sensor and mount the sensor on the vehicle.

The sensor is normally mounted on the front nearside wheel, since this experiences the least wheel lift or lockup.

Do not over-tighten the wheelspeed sensor, and avoid mounting the sensor too close to the brake disc (to avoid superheating).

2 Secure the cable of the sensor on the wishbone and into the front nose cone (on a formula car), or through to the engine bay (on a saloon car).

3 Cover the wheelspeed sensor cable with spiralwrap.

Make sure the cable is not tight when the wheel moves or the wishbone is lowered.

4 Mount the wheelspeed trigger on the wheel.

See earlier description of trigger types. Make sure that the sensor head does not touch any of the triggers.

5 Set up the sensor with an approximate gap of 0.7mm (0.28”).

RPM measurement

The C-dash can measure the engine RPM in three ways:

- digital 'tacho' signals (vehicles with electronic ignition)
- the RPM box with Low Tension (LT) input (e.g. standard contact breaker ignition systems)
- the RPM box with High Tension (HT) input (e.g. electronic ignition systems where no tacho signal is available).

The RPM Box generates its own tacho signal from the LT or HT signals on the vehicle.

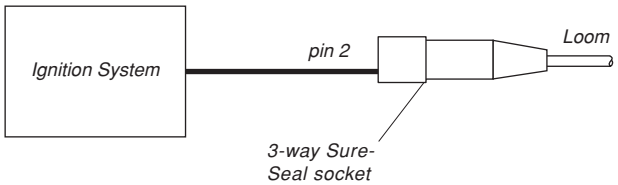
Tachometer Signals

The C-dash unit can accept a 'tacho' feed from most electronic ignition modules.

Connector	3-pin Cannon Sure-Seal
Connections	Pin 2 (Violet) Signal

A spare connector has been included in the installation kit. Only pin 2 needs to be connected; the ignition system and the C-dash must share the same earth.

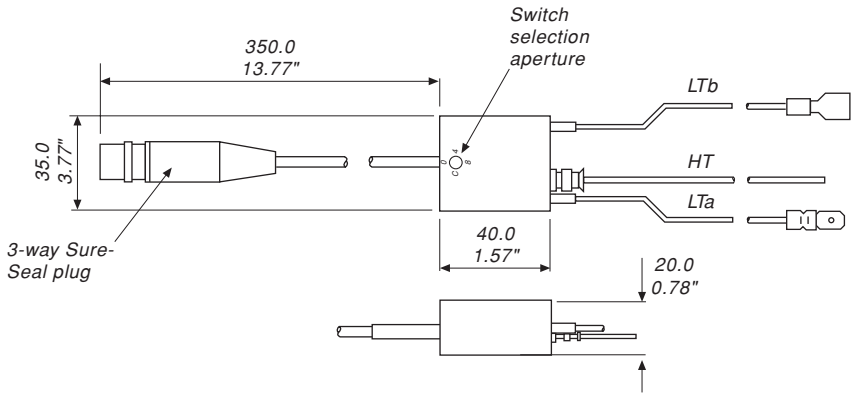
If you have a low voltage digital tacho signal on your vehicle (from the ignition system), locate the wire and connect it to pin 2 of the 3-way Sure-Seal plug connector supplied.



Tachometer connections

When the loom is installed, the tacho signal will be connected to the signal input on the RPM connector.

The RPM Box



RPM Box		
Mounting	Industrial Velcro®	
Connector	3-pin Cannon Sure-Seal	
Connections	Pin 1 (Green)	Ground
	Pin 2 (Blue)	Signal
	Pin 3 (Red)	Power

The RPM box either picks up current pulses from the LT side of the coil, or voltage pulses from the master HT lead.

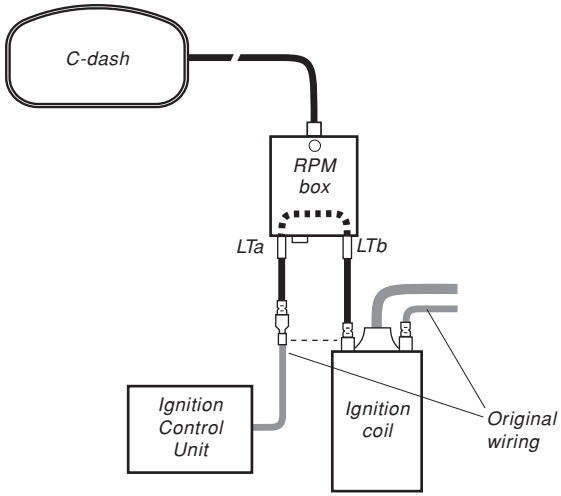
WARNING: To prevent damage, neither of these sources should be directly connected to the C-dash.

The RPM Box should be fixed using Industrial Velcro®, near the ignition coil but not mounted to it. A suitable mounting position can usually be found which allows the LT connection to be made without extending the wiring provided.

RPM Box LT connection

The LT (Low Tension voltage) connection on the RPM Box has two flying leads.

1. Remove the connection from the coil to the ignition unit and connect one of the flying leads on RPM Box to the free end of this wire.
2. Connect the other lead from the RPM Box to the coil.



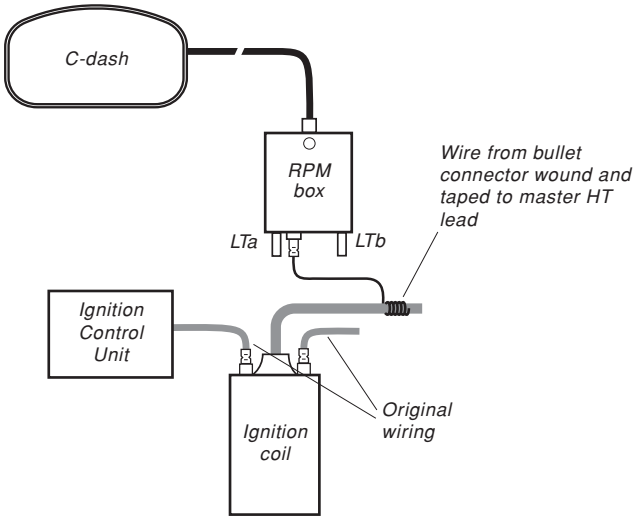
The RPM Box connected using LT leads

Notes

- The wires coming from the RPM box are two ends of a piece of wire; there are no electrical connections inside the box. The ignition signal is unchanged, as long as the connections are good.
- The RPM Box can be sensitive to the direction of the current pulse it receives. If this causes a problem, try connecting it into the other terminal of the ignition coil. This reverses the direction of the current flowing in the wire and should resolve the problem.
- If the spade connectors on the RPM Box do not fit the terminals on your vehicle, we suggest you replace the connectors on *our* box. You can then remove the RPM box at a later date, if you wish.

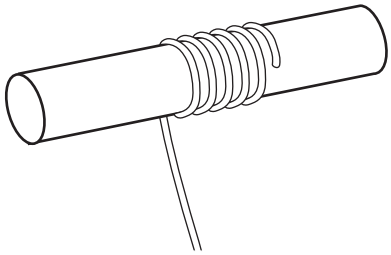
RPM Box HT connection

The HT (High Tension voltage) connection consists of a single wire running from the bullet connector in the RPM Box and wrapped around the HT lead of the vehicle. A piece of wire (high temperature rated) with a bullet connector has been included with the RPM Box for this purpose.



The RPM Box connected to HT lead

The wire should be wrapped around the master HT lead about five times: any excess can be clipped off and then secured with tape. The RPM box LT connections are not used and can be joined together and taped up.

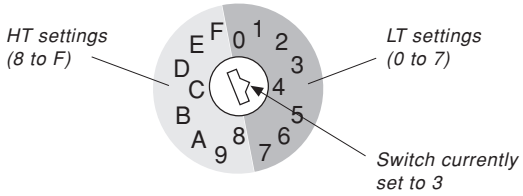


HT pickup – detail

NOTE: The RPM Box is sensitive to the polarity of the HT pulse it receives. If this causes a problem, try using the LT pickup method.

Setting up the RPM Box

The dash needs to be set up to use the signal from the RPM Box. This is done by setting the RPM Pulse type to D. The RPM Box has a small 16-position switch which needs to be set to match the signal received. Legends for positions 0, 4, 8 and C (=12) are printed on the box, but the intermediate settings are available. Settings 0 to 7 should be used with LT (ignition coil) connections. Settings 8 to F should be selected if using the HT connection.



RPM box switch settings

The settings are related to the number of sparks per minute the engine needs at maximum RPM, as in the following table:

Max. sparks/min.	LT	HT	Typical example
11,000	0	8	11,000 RPM 2-stroke (11,000 sparks/min.)
19,000	1	9	7,500 RPM 4-stroke (15,000 sparks/min.)
36,000	2	A	V8 single coil 4-stroke (30,000 sparks/min.)
45,000	3	B	
54,000	4	C	
64,000	5	D	
85,000	6	E	
95,000	7	F	

Notes

- RPM measurement is more reliable when unwanted signals are filtered out. Setting the box sets the frequency at which signals are filtered out, e.g. Setting 1 filters out signals higher than 19,000Hz.
- If the RPM reading on the dash starts to flash at high RPM, try increasing the setting by one or two positions.
- Do not be afraid of experimenting until you find the correct setting for your vehicle, as an incorrect setting will not damage the unit.

Example Setups

4-cylinder 4-stroke

A 4-cylinder, 4-stroke engine generating 2 sparks/revolution, at 7500 RPM maximum requires the RPM Box to respond to 15,000 sparks/min. The switch then needs to be set to 1 for LT pickup or 9 for HT pickup.

RPM Box	1 (LT)	9 (HT)
Dash RPM Settings:		
PULSE	4	[pulses per 2 revolutions]

1-cylinder 2-stroke

A single cylinder, 2-stroke engine generating 1 spark/revolution, at 11,000 RPM maximum requires the RPM Box to respond to 11,000 sparks/min. The switch on the RPM Box needs to be set to 0 for LT pickup or 8 for HT pickup.

RPM Box	1 (LT)	8 (HT)
Dash RPM Settings:		
PULSE	2	[pulses per 2 revolutions]

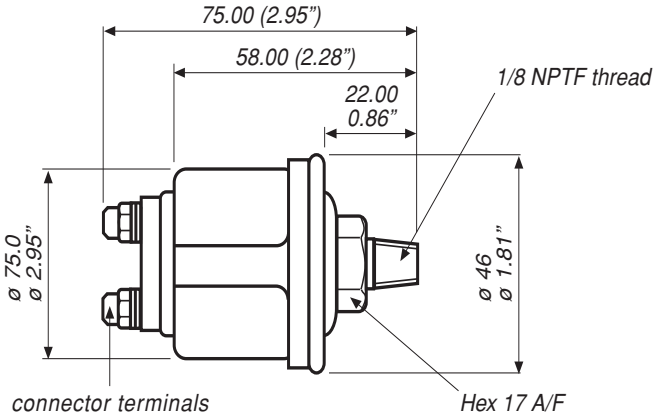
The dash assumes a normal 4-stroke engine that runs from one ignition coil. 1-cylinder 2-stroke engines fire on every rotation and appear as 2-cylinder engines.

4-cylinder 4-stroke with double coils

A 4-cylinder, 4-stroke engine with double coils generating 1 double spark/revolution per coil, at 13,500 RPM maximum requires the RPM Box to respond to 13,500 sparks/min. The switch then needs to be set to 1 for LT pickup or 9 for HT pickup.

Care must be taken to ensure that the RPM Box only picks up signals from one of the coils. Then set the RPM PULSE to 2.

Pressure measurement



Pressure Sensors (dimensions in millimetres and inches)

Standard Pressure sensor	
Operating Range	0 to 200 psi 0 to 14.07 Kgf 0 to 13.78 bar
Mounting	7mm 1/8 NPTF thread
Connector	2 off 4mm ring tag
Connections	non-polarized (5V and signal wires)
Explosion rating	35 bar

The same sensors are used for fuel and oil pressure measurement. The colour coded wiring on the loom determines how they should be connected (see Part B: Fitting the wiring loom).

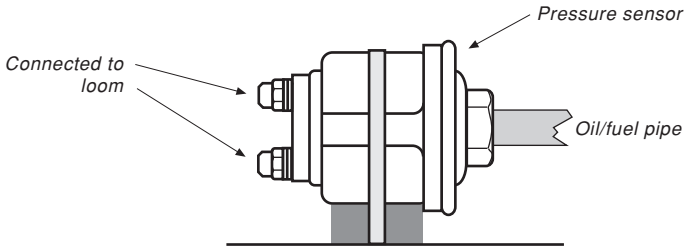
The connections to the standard sensor are made using 4mm ring tags. They are unpolarised and can be connected either way around.

Other pressure sensors are available, which use spade connectors, instead of ring tags.

Mounting the pressure sensors

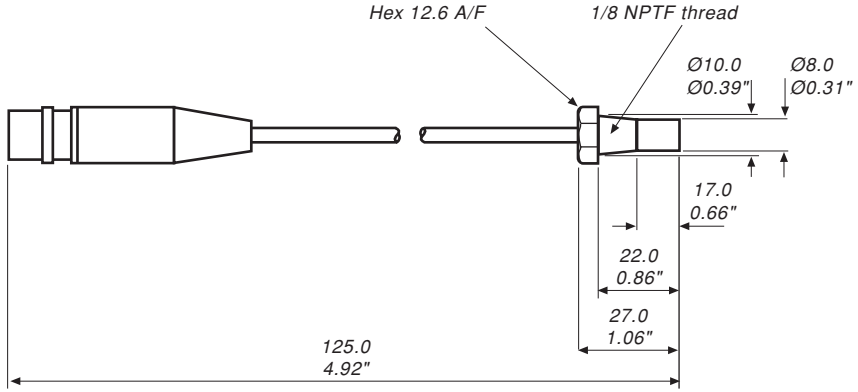
Indirect fitting

Mount the pressure sensors on a side pod near to the fuel/oil pumps using tie-wraps and rubber pads.



Indirect fitting of pressure sensors

Temperature measurement



Imperial thread Temperature Sensor

Temperature sensor (Imperial)		
Operating Range	0°C to 150°C (32° to 302°F)	
Accuracy	±2.5°C (±4.5°F)	
Mounting	7mm 1/8 NPTF thread 17mm extending past thread	
Connector	2-pin Cannon Sure-Seal	
Connections	Pin 1 (White)	Signal
	Pin 2 (Red)	Power (12V)

WARNING: The sensors can be adversely affected by water. Waterproof connectors have been supplied, but it is essential to use the silicone sealing compound to prevent water reaching the connectors from the loom wiring.

If water penetrates the connector, dry it out, reconnect, then seal using a silicone sealant.

The sensors for coolant and oil temperature are exactly the same. The colour coded wiring on the loom determines how they should be connected (see Part B: Fitting the wiring loom).

Mounting the temperature sensors

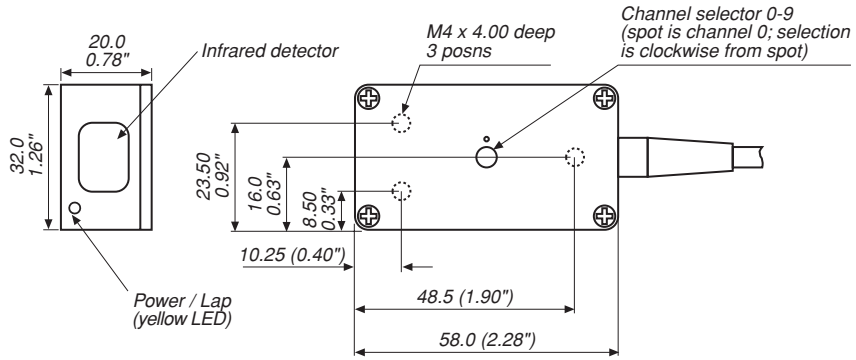
Mount the oil and coolant temperature sensors in the piping of the engine.

The coolant temperature sensor is normally mounted in the piping of the cooling system, either in an existing mounting point or by braising and threading an extra one.

The oil temperature sensor is normally mounted either in the sump area or in the piping of the oil pump.

NOTE: The sensors have their own earth, so earthing the body of the sensor or isolating it from the vehicle will have no adverse effect.

Lap timing



10 channel Beacon Detector

The Beacon detector		
Mounting	Industrial Velcro® or 3 off M4 holes in the base.	
Channels	0 to 9	
Connector	3-pin Cannon Sure-Seal	
Connections	Pin 1 (Green)	Ground
	Pin 2 (Blue)	Signal
	Pin 3 (Red)	Power (12 V)

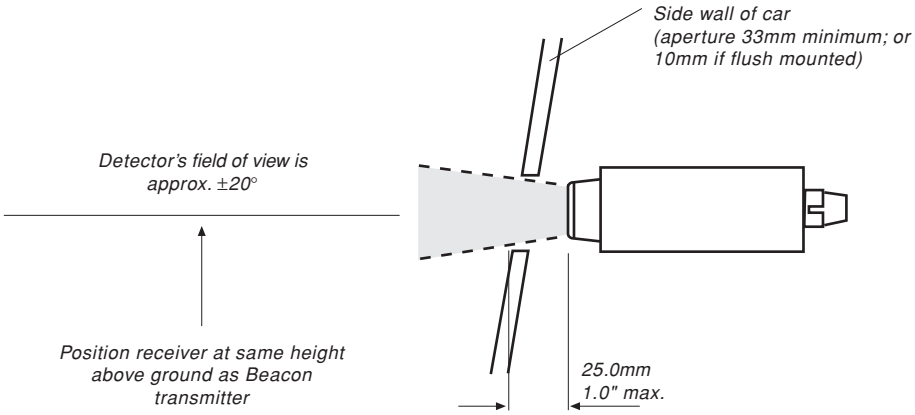
Notes

- The Beacon detector should be mounted at right angles to the ground and at right angles to the direction of the vehicle in motion.
- Where possible, the detector should be mounted flush to the skin of the vehicle, or recessed less than 25mm.
- Where possible, the receiving head should not face directly into the sun while detecting.

Mounting the Beacon detector

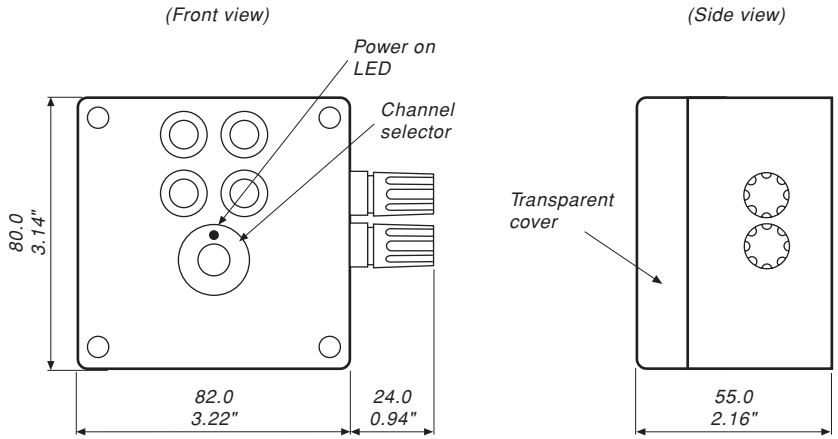
The Beacon detector should be mounted so that it can point at either side of the track. It is often placed by the roll hoop or above the driver's headrest.

The detector is fixed to the vehicle with Industrial Velcro® (supplied by Pi Research).



Beacon detector placement

Beacon transmitter

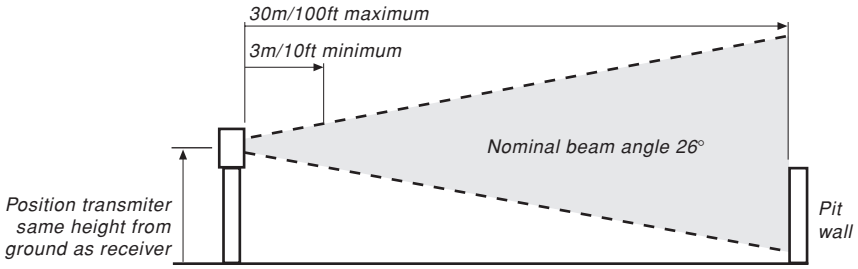


Beacon transmitter

Beacon transmitter	
Mounting	Industrial Velcro® or tape
Channels	0 to 9
Connector	2 screw posts
Connections	Red post +12V; Black post 0V

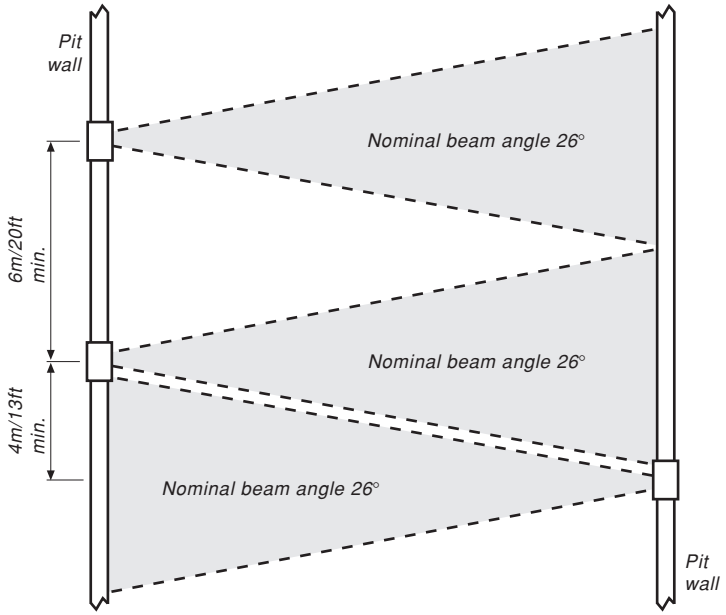
Notes

- A fully charged 12V vehicle battery or rechargeable dry cell battery can be used to run the Beacon transmitter.
- Make sure that the channels selected on the detector and transmitter are the same.
- The transmitter should be mounted at the same height as the detector on the vehicle, with the transmitter beam pointing horizontally and aimed straight across the track. Make sure the detector is not pointing into the sun when it passes the transmitter.



Siting a Beacon transmitter (driver's view)

If several Beacon transmitters are in use at a track do not place them so close together that their beams interfere with one another, as this could give rise to spurious lap times. The following diagram shows the minimum separation distances to be observed.



Minimum separation of transmitter Beacons (plan view)

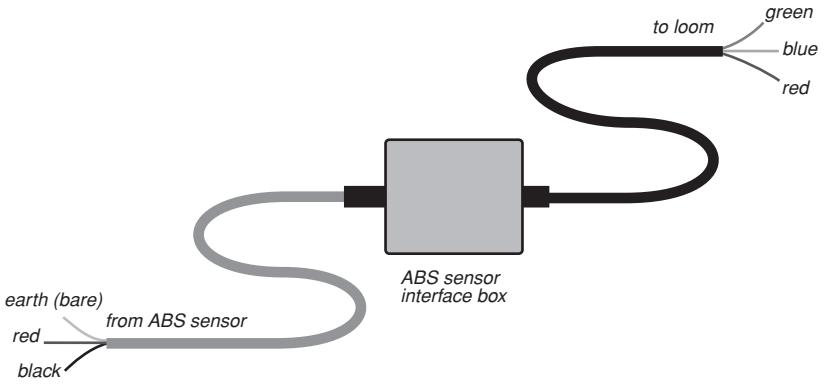
Optional sensors and interface boxes

There are range of sensors and interface boxes available for use with your C-dash. These can replace some of the standard sensors supplied.

The table below details which sensors and interface boxes can be used on which channels. Please note that the C-dash channels are pre-calibrated and cannot be used with alternative sensors unless they appear in the table.

Standard Channel	Alternative Use	Optional sensors
Wheelspeed	ABS wheelspeed	ABS sensor interface box
	Boat speed	Waterspeed sensor
	Fastest/slowest wheel speed	Wheelspeed selector box
RPM	RPM	Tacho pulse input
Oil temperature	EGT	System 2 thermocouple + amp
Oil pressure	Turbo pressure	Pressure sensor (low)
	Carburettor pressure	Pressure sensor (low)
Fuel pressure	Turbo pressure	Pressure sensor (low)
	Carburettor pressure	Pressure sensor (low)
	Sequential gear position	Depends on gearbox design

ABS sensor interface box



ABS sensor Interface Box

Grey lead connects to ABS sensor
Black lead connects to the wheelspeed connector on the C-dash loom

ABS sensor interface box		
Mounting	Industrial Velcro®	

ABS sensor connections		
Maximum input freq.	99 pulses per wheel revolution	
Connector	Un-terminated	
Connections	Foil	Screen (do NOT connect)
	Red	Signal
	Black	Reference

The C-dash connections			
Connector	Un-terminated or 3-pin Canon Sure-Seal		
Connections	Pin 1	Green	Ground (0V)
	Pin 2	Blue	Signal
	Pin 3	Red	Power (12V)

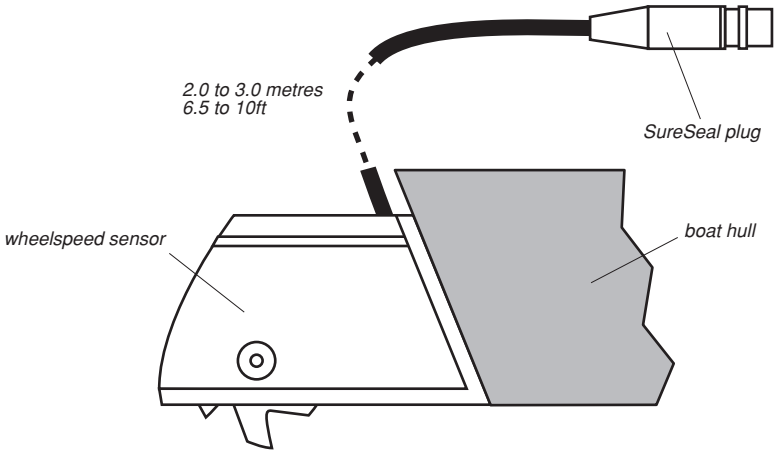
The ABS sensor interface box enables the C-dash to take wheelspeed information from an existing ABS (Anti-lock Brake System) speed sensor. ABS speed sensors provide a robust wheelspeed measurement on touring and rally cars where mounting of the standard C-dash wheelspeed sensor might provide difficult.

The interface box has been designed for use with two wire ABS speed sensors (passive type).

WARNING: If the ABS speed sensor is also used by the ABS system on the vehicle, the two wires from the C-dash interface box should be connected to the sensor connections via 100µF 16V capacitors, with the negative side of the capacitor going to the sensor. If in doubt please contact your Pi representative.

Do not connect any wires directly to the chassis of the vehicle.

Waterspeed sensor

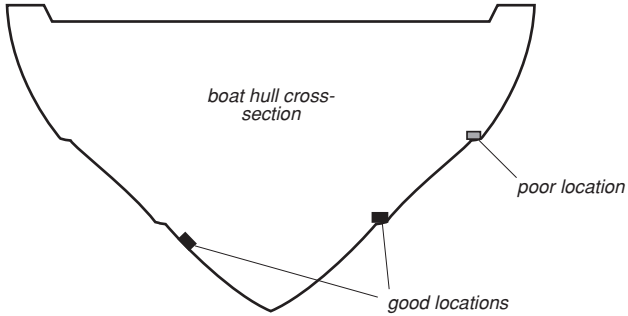


Waterspeed Sensor attachment

Waterspeed sensor			
Sensing type	Hall effect pick-up off 6 point paddle wheel		
Mounting	Via two 5mm mounting slots		
Mounting position	On boat's transom in smooth water flow		
Connector	3-pin Cannon Sure-Seal		
Connections	Pin 1	Shield	Ground
	Pin 2	Orange	Signal
	Pin 3	Blue	Power (5–12V)
	Yellow	n/c	

The waterspeed sensor can be used to measure boat speed through the water. The sensor can measure the effective speed of offshore boats which may be out of the water up to 50 percent of the time.

The sensor should be mounted on the boat's transom where the flow of water is least turbulent. The left (port) side of the transom is preferable; if it is impractical to mount it there, the right side can be used. Don't mount the sensor behind strakes or ribs, as these disturb the water flow to the speed sensor. Also make certain that the sensor will remain in the water even when the boat is on plane. The sensor is generally mounted about one foot from the boat's centre line.

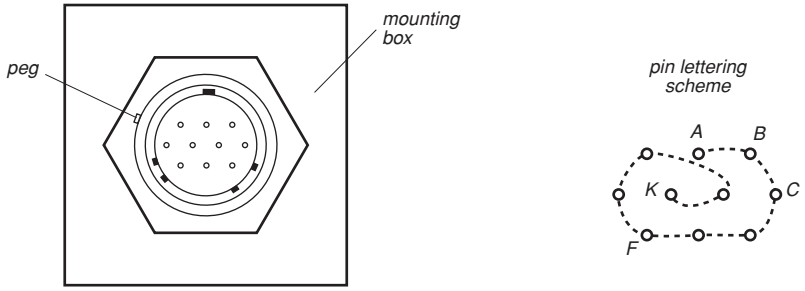


Positioning the Sensor on the hull

When setting 'tyre size' and 'triggers' on the dash, try using 650mm and 20 pulses/rev. A hand held Global Positioning System can be used to check the calibration.

If you experience any problems, contact your Pi representative.

Wheelspeed selector box



Wheelspeed selector box connector pinout

Wheelspeed selector box		
Mounting	Industrial Velcro®	
Supply voltage	6–18V	
Supply current	4mA	
Connector	KPT 2E 12-10P (Cannon or equivalent)	
Connections	Pin A	Wheelspeed 1 sensor signal
	Pin B	Wheelspeed 1 sensor reference
	Pin C	Wheelspeed 1 screen
	Pin D	Wheelspeed 2 sensor signal
	Pin E	Wheelspeed 2 sensor reference
	Pin F	Wheelspeed 2 screen
	Pin G	Supply 0V from dash
	Pin H	Fastest wheelspeed signal to dash
	Pin J	Supply 12V from dash
	Pin K	Slowest wheelspeed signal (5V only)
Fastest signal (H)	Open drain output which can be connected to the C-dash	
Slowest signal (K)	Open drain output which can be connected to the C-dash	

The wheelspeed selector box monitors any two ABS speed sensors and outputs the fastest and slowest values. The fastest speed should be used in applications where

wheels may lock during severe cornering (e.g. touring cars). The slowest speed should be used in applications where wheels may spin due to poor traction (e.g. rallying).

The dash must be set up for the number of triggers on the ABS sensor wheel.

If the ABS speed sensor wires are long or run through an electrically noisy environment, it may be advantageous to use screening braid. This should only be connected to the selector box and must not be allowed to earth to any metalwork on the vehicle.

WARNING: The 12V supply (Pin J) for the selector box should come from the C-dash, not directly from the vehicle battery.
Do not connect supply 0V (Pin G) if the ABS speed sensors are earthed.

Turbo/carburettor pressure sensor

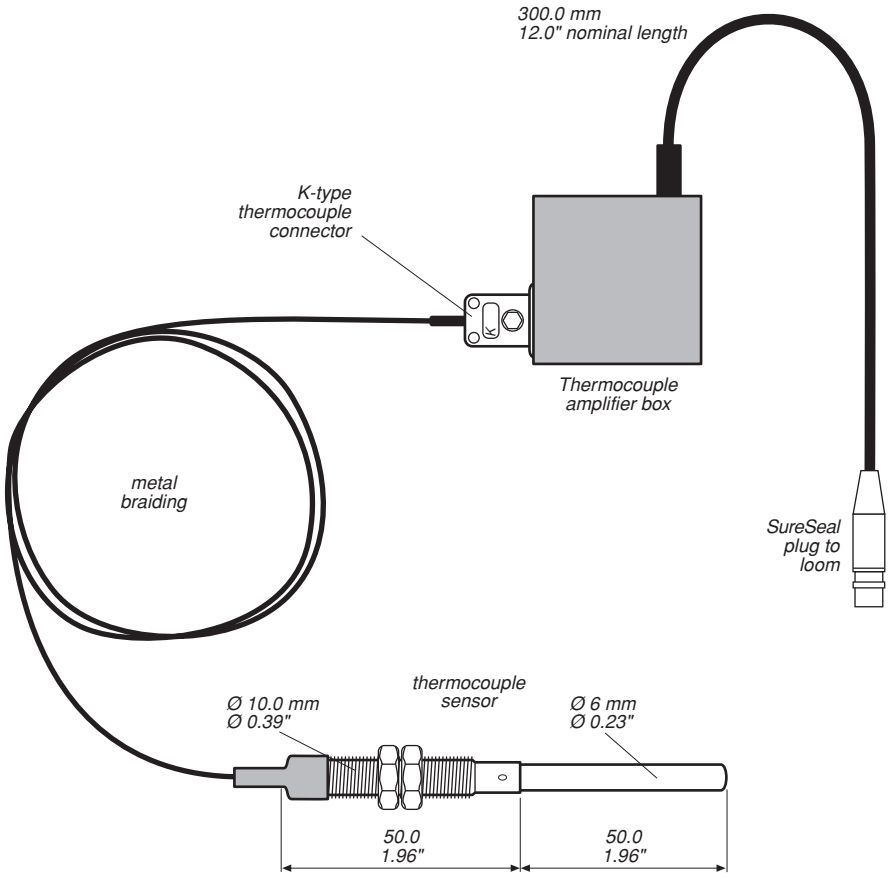
The low pressure sensor has the same physical dimensions as the standard C-dash pressure sensor.

Turbo/carburettor pressure sensor	
Operating Range	0-40 psi (0 to 2.5 bar)
Mounting	7mm 1/8 NPTF thread
Connector	2 off 1/4-inch female blade
Connections	non-polarised
Explosion rating	35 bar

This low range pressure sensor can be used to measure turbo charger pressure or carburettor fuel pressure. The sensor reads down to 0 psi. Care must be taken when attempting to measure carburettor pressure: pressures caused by lateral or longitudinal g may generate pressure readings to the same level as those caused by draw of the carburettor.

The relevant pressure channel must be configured as tbar under the Setup UNITS page.

Thermocouple sensor



Thermocouple Sensor

Thermocouple probe and amplifier

Probe			
Operating range	100°C to 999°C		
Mounting	With lock nuts		
Connector	K-type		
Connections	Blue	–ve	
	White	+ve	
Amplifier			
Mounting	Velcro		
Sensor connector	K-type		
System connector	3-pin Cannon Sure-Seal		
Connections	Pin 1	Green	Ground (0V)
	Pin 2	Blue	Signal
	Pin 3	Red	Power (12V)

The thermocouple is used to measure exhaust gas temperature (EGT) on vehicles with 2-stroke or 4-stroke engines. On 2-stroke karts, EGT is a good indicator of fuel mixture.

Extension leads can be used in conjunction with the sensor, but they must have the same metals and polarity.

Setting up the gear number option

You can set the C-dash to display the gear number. The gear number option replaces the Fuel Pressure input.

To set up gear numbers:

1. Fit a potentiometer to the gear box so that the output of the potentiometer depends upon the gear selected.
2. Connect the output from the potentiometer to the Fuel Pressure input channel.
3. Click and hold the CHANNEL and MODE/LAP switches so that the C-dash goes into Setup mode.
4. Click the CHANNEL switch until the Options page appears.
5. Click and hold the CHANNEL switch until the Bright page appears.
6. Click the CHANNEL switch until the Gears page appears.
7. Click MODE/LAP switch to select the number of gears you have.
8. Click the CHANNEL switch. The Neutral Gears setup page appears.

The raw count from the gear box potentiometer is displayed on C-dash field 4.

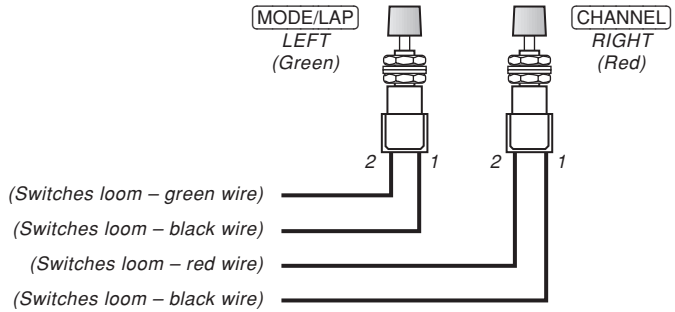
9. Select neutral gear position on the gearbox.
10. Click the MODE/LAP switch. The raw count input for neutral gear is stored and the C-dash gear number display changes to 1.
11. Select first gear and click the MODE/LAP switch. The raw count for first gear is stored and the C-dash gear number display changes to 2 ready to record the raw count for second gear.
12. Repeat step **11** to store the raw count for each gear.
13. Click and hold the CHANNEL and MODE/LAP switches so that the C-dash returns to Realtime Page A mode.

The Gear number can be viewed on Realtime Page B in field 4 before the vehicle has been driven. In Race mode the gear number is shown in the page ident field of the C-dash.

Remote push buttons

The remote push buttons are used to control the C-dash. The buttons are normally-open momentary push buttons which pull an input on the dash to ground when pressed.

Mount the buttons so that they can easily be reached by the driver. They should be installed so that the CHANNEL button is on the drivers right.



Remote push buttons

Connecting the remote push buttons

The remote push buttons are connected to the switch branch of the loom that has the yellow collar. You can fit the C-dash and remote push buttons onto a steering wheel, or use the optional switches extension loom to fit the C-dash onto a dash panel.

To fit the remote push buttons:

1 Fit the remote push buttons to the dash panel or the steering wheel.

2 Fit 200mm lengths of heatshrink DR25 1/8 black heatshrink over wires for switch 1.

For wire details refer to table *Switches loom (yellow sleeve) wire details* in Part E.

3 Repeat step 2 for the wires for switch 3 and if used, for switch 2, switch 4 and the Dimmer inputs.

If switch 2, 4 and dimmer inputs are used, a wire from switch 1 or switch 3 ground is needed for the ground signal for these inputs. If these inputs are not used the wires may be cut off and taped under the ATUM 12/4 heatshrink junction. MAKE SURE THEY DO NOT TOUCH EACH OTHER OR CHASSIS.

4 Seal the sleeving junctions at the loom with a 50mm piece of ATUM 12/4 glue lined heatshrink. Crimp closed the end of the heatshrink in between the cables whilst the heatshrink is hot.

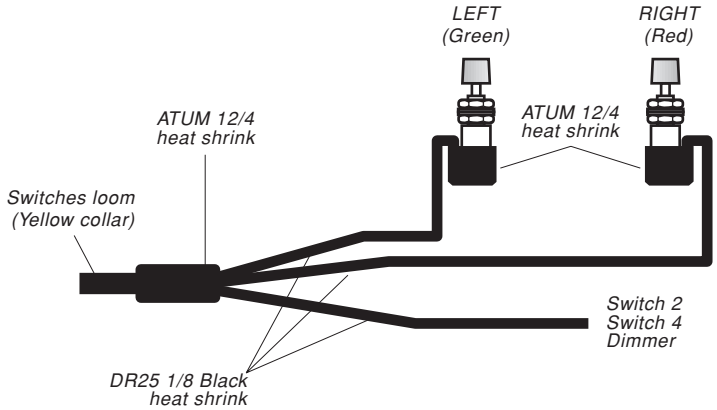
5 Place a piece of small heatshrink sleeve on each wire. Do not shrink the sleeve.

6 Solder the wires to the remote push buttons.

7 Move the heatshrink sleeve over solder joint and shrink the heatshrink.

8 Fold the wires back next to the switch body.

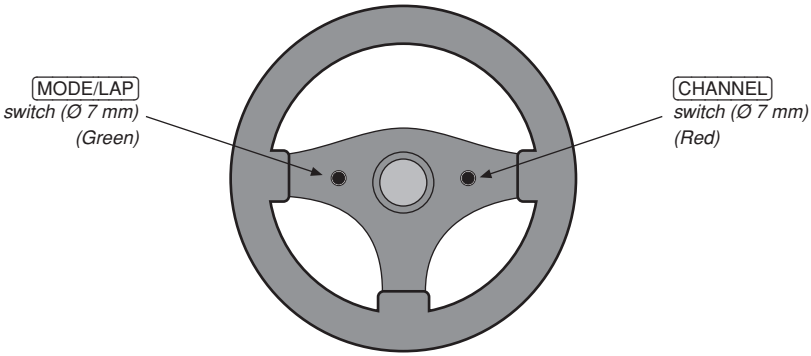
9 Cover the wires, the body and the terminals of the switch with a 25mm length of ATUM 12/4 heatshrink. Crimp closed the end of the heatshrink around the terminal end of the switch when the heatshrink is still hot.



Fitting the heatshrink to the loom

Fitting the buttons to a steering wheel

When fitting the buttons to a steering wheel ensure that the push buttons cannot accidentally be pushed when the steering wheel is being turned.



Push buttons fitted to a typical steering wheel

Connecting the switches extension loom

1. Locate a position for the D type socket on the dash panel.
2. Cut the wires on the C-dash switches loom to reach the D type socket. Cover the wires with 3/8 DR25 heatshrink.
3. Cover the joint between the new heatshrink and the existing sleeving with a 50mm piece of ATUM 12/4 glue lined heatshrink.
4. Place a piece of small heatshrink sleeve on each wire. Do not shrink the sleeve yet.
5. Solder the wires to the D type socket. Refer to the table *Switches loom (yellow sleeve) to D type socket wiring details* Part E.
6. Move the heatshrink sleeve over each solder joint and shrink the heatshrink.
7. Fit the D type socket into the vehicle dash panel. The socket can be fitted to the dash panel by removing the connector hood and using the 2 female screw posts. Use a thread locking glue to stop the nuts from rotating free.

8 Fit the remote push buttons to the extension loom following the instructions given in section *To fit the remote push buttons*.

Note: The ground wire for Switch 3 in the Switch extension loom is brown, NOT black as in the Switches loom (yellow sleeve).

Part B : Fitting the wiring loom

By this stage you should have mounted the C-dash and all the sensors on the vehicle. You are now ready to connect everything together. The loom is supplied in two parts, one part for C-dash display functions and the other to connect sensors to the C-dash. Each part is terminated at one end with a Deutsch connector.

Connect the loom to the C-dash

Take the two parts of the loom and plug the Deutsch connectors into the respective mating connectors on the rear of the C-dash. To aid identification, the display part of the loom has a blue collar, and the sensors part of the loom has a red collar.

Lay the loom in the car

The wires for each of the sensors are grouped, colour coded and tagged with their identity. Run the wires to each of the sensors on the car. Take care to avoid sharp metal edges and cables carrying high voltages (e.g. ignition circuits).

System supply

You may need to untwist the power and ground supply wires if the battery is at the front of the vehicle (connect red wire from loom) and the Master switch is towards the rear (connect black wire from loom).

Beacon

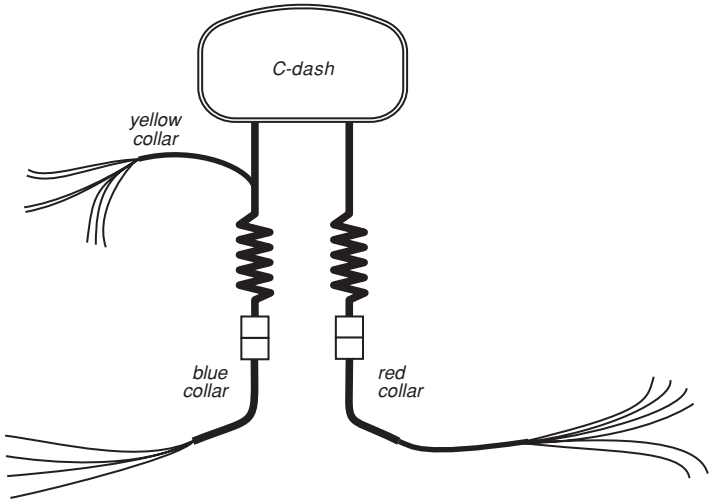
Run the Beacon connections to a suitable position (e.g. by the roll hoop), even if you do not yet have a Beacon kit.

Secure unwanted sensor wires

Isolate any wires you are not using near the dash and insulate the ends with tape. Keep the sleeve and wire idents on the loom to facilitate identification at a later date.

Cut the Loom to size

Now that the loom is lying in the car, you can determine how long each group needs to be. Before cutting the wires, the loom should be consolidated by grouping sensor wires together and taking branches where particular sensors require it.



The wiring loom

You should use tape at each branch point to hold the loom in shape.

The individual sensor groups are now ready to be cut to length. Use tape to mark the length required, untwist the wires and slide the ident sleeve AND individual wire idents to the marked point. Be sure to leave enough length so that connections are not under stress.

Cut the branches to length and tie the loose ends to prevents the idents sliding off. Cut all the wires to the same length for each sensor.

Fit the connectors and spiralwrap. In most cases, you can do this more easily if you remove the loom from the car.

Fit Sure-Seal connectors to the loom

The Oil temperature, Coolant temperature, RPM, Wheelspeed, and Beacon sensors are supplied terminated with 2-pin or 3-pin Cannon Sure-Seal connectors. You must fit the respective connector to the sensor loom. The sensor loom is then connected to the C-dash via a Deutsch connector. The connections for each sensor wire are given in the tables below.

Note that on the loom, pin 1 is always a socket and pins 2 and 3 are always pin contacts.

2-pin Cannon Sure-Seal

Function	Pin1 (socket)	Pin2 (pin)
Oil temperature	Yellow	Red
Coolant temperature	Blue	Red

3-pin Cannon Sure-Seal

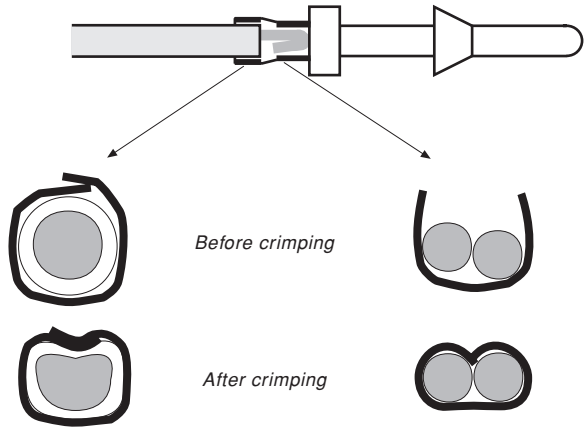
Function	Pin1 (socket)	Pin2 (pin)	Pin3 (pin)
RPM	Black	Violet	Red
Wheelspeed	Black	White	Red
Beacon	Black	Green	Red

Crimping a contact onto each wire

Take one wire (for example, the yellow wire for the Oil Temperature):

1. Strip approximately 8mm of insulation off the wire, taking care not to cut the wire itself.
2. Twist the strands of wire together.
3. Fold the stripped portion of the wire in half to form a tight loop.
4. Take a contact (socket for yellow wire) from the plastic bag and place it in aperture 3 of the crimp tool provided.

The two smaller clamping prongs should be facing the 'W' shaped part of the tool.



Waterproof connector crimp connections

5. Push the looped end of the wire right into the contact and crimp it by squeezing the handles all the way together.
6. Fold in the cable grip wings one at a time.

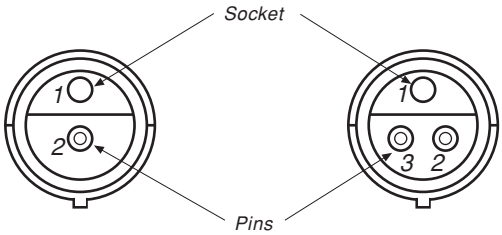
Use the flat front end section of the crimp tool (or a small pair of pliers) to fold in the cable grip wings one at a time, to hold the cable insulation.

7. Crimp the cable grip wings.

Finally, using aperture 3 of the crimp tool, crimp the cable grip wings so that they actually grip the insulation on the wire.

8 Repeat this process to crimp a pin contact onto the red wire for the oil temperature connector.

Insert the contact into the connector



Cannon Sure-Seal connectors viewed from rear

1 Take one of the rubber 2-way connectors from the bag, and locate the contact insertion tool provided.
2 Slide the slot in the tool over the yellow wire (for example) and push the tool up to the neck on the contact.
3 Pick up the connector and push the contact firmly into hole 1 in the body until it is flush with the mating face on the inside of the connector.
4 Check that the contact is correctly located in the body then withdraw the tool.
5 Repeat this process for the red wire, pushing it into hole 2 on the connector.

Waterproof the Sure-Seal connectors

The Sure-Seal connectors must be fully waterproofed. This is done by sealing the rear of the loom connectors with the silicone sealer provided to stop water penetration. Once applied, leave the silicone to cure for one hour.

WARNING: Failure to waterproof the multiway connectors will not damage your C-dash but certain readings can be affected by water.

Repeat the process for each sensor

After the Oil temperature sensor has been connected, repeat the entire crimping and insertion process for the:

- Coolant temperature sensor
- RPM sensor
- Wheelspeed sensor
- Beacon sensor

WARNING: Failure to terminate any of the wires could lead to a short circuit of the dash.

Fit the spade connectors

Use the spade connectors for 0—40 psi and 0—120 psi pressure sensors.

Unpolarised blade connections		
Oil Pressure	Black	Green
Fuel Pressure	Black	White

1. Once cut to length, strip about 5mm of insulation off each wire. DO NOT LOOP the wire.
2. Take a spade connector and grip it gently in the crimp tool. Slide the wire into the connector until it hits the small stop.
3. Squeeze the tool to crimp the connector, making sure that the bare wire is crimped securely.
4. Repeat this process for the remaining wires.

Fit the 4mm ring tags

Use the 4mm ring tags for 0—200 psi pressure sensors.

Unpolarised 4mm ring tags		
Oil Pressure	Black	Green
Fuel Pressure	Black	White

Repeat the procedure for the spade connectors detailed above.

Use the knurled finger nut and split washer to secure the ring tag to the sensor.

NOTE: Ensure that the spit washer is between the ring tag and the knurled finger nut.

Fit the spiralwrap

Starting at the sensor/branch ends fit the spiralwrap to the loom, using the small size for 2 or 3 wire groups and the larger size for 4 or more. Wrap all the way back to the connector at the dash end of the loom.

Once the loom has been wrapped it is finished and can be reinstalled in the vehicle.

Reinstall the loom

1 Connect the dash, sensors and the power connections to the loom.

Part C: System checks and Power-up

Check the installation

Before turning the C-dash on, check:

- the clearance on the wheelspeed sensor
- the freedom of wires from moving parts
- the silicone sealant on the connectors
- the connectors on the back of the dash
- no wires have been left un-terminated.

Turn the C-dash on

When you turn on the Master switch the C-dash powers-up. (Note that on some installations the ignition must also be turned on.)

Realtime page A is displayed. By clicking the CHANNEL button you can switch between Realtime pages A and B to view the values being measured on each sensor.

The road wheel can be rotated backwards and forwards to get the wheelspeed sensor to trigger.

The RPM display shows *0* until the engine is running.

The battery voltage of the vehicle is displayed.

Once the dash has been configured to use a Beacon detector (see below), waving a powered beacon transmitter in front of the detector causes lap times on the display to change. Make sure the channel settings on the Beacon and the beacon transmitter are the same.

Set up the C-dash

Before using the C-dash, you must set up it to show the correct RPM, Speed and Units, etc. If you are using a Beacon, this must also be set on the C-dash. Refer to the Setup section.

WARNING: When you set up your C-dash please take time to write down the settings and have them available when seeking technical support from Pi Research.

Troubleshooting

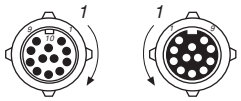
All the troubleshooting hints are in a separate section. If you have any problems with your C-dash, refer to the section *Troubleshooting*.

Part E: Wiring details

C-dash wiring Information

Deutsch connector details

Item	Loom connector	C-dash connector
Display loom (blue collar)	Plug IMC26-2212X	Receptacle IMC21-2212X
Sensors loom (red collar)	Receptacle IMC21-2212X	Plug IMC26-2212X



12-way plug and 12-way receptacle viewed from front

Pi Research Part Number for the 12–way receptacle is 09G-0297 and the 12–way plug is Part Number 09G-0298.

Display loom (blue collar) connector pin details

Pin	Function	Pin	Function
1	Udders/ECM in	7	Battery +
2	Udders out	8	+12V for sensors
3	Data to PC	9	Over rev
4	Data from PC	10	Battery –
5	Wheelspeed	11	Ground
6	Beacon	12	Ground

Sensors loom (red collar) connector pin details

Pin	Function	Pin	Function
1	Oil pressure	7	+12V
2	Fuel pressure	8	+12V
3	Coolant Temperature	9	+5V
4	Oil temperature	10	Ground
5	Dimmer	11	Ground
6	RPM	12	Beacon†

† Can be used instead of Display loom pin 6.

Switches loom (yellow collar) unterminated wiring details

Colour	Function	Colour	Function
Green	Switch 1 (Green button)	Black	Ground
Blue	Switch 2 input	Black	Ground
Red	Switch 3 (Red button)		
White	Switch 4 input		
Yellow	Dimmer input		

Female blade connectors (for 0—40 psi pressure connection)

Sensors	Pins	Colours	Length (mm)
Turbo Pressure	2	Black, Green	2000

4mm Ring tags (for 0—200 psi pressure connection)

Sensors	Pins	Colours	Length (mm)
Oil Pressure	2	Black, Green	2000
Fuel Pressure	2	Black, White	2000

8mm Ring tags (for power connection)

Function	Colour	Length (mm)
System power	Red	2000
System ground	Black	2000

Waterproof ITT Cannon Sure-Seal connectors

Sensor	Pins	1	2	3	Length (mm)
Oil Temp	2	Yellow	Red	—	3000
Coolant Temp	2	Blue	Red	—	3000
Beacon	3	Black	Green	Red	2000
RPM	3	Black	Violet	Red	3000
Wheelspeed	3	Black	White	Red	3000

Setup

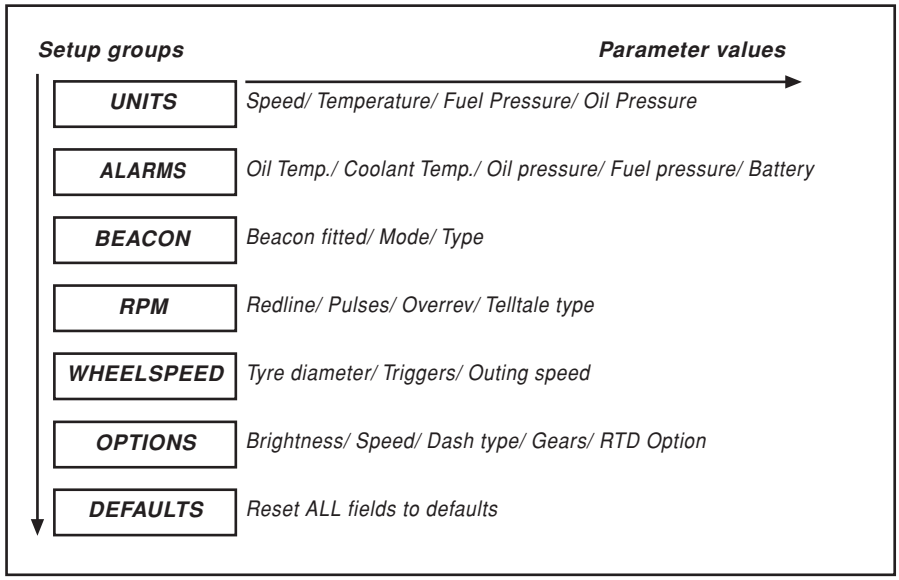
Setup mode

This section describes in detail how to setup the C-dash. You will need to do this when you first install a C-dash. You may also wish to adjust alarm thresholds when you are more familiar with the C-dash.

To allow the C-dash to be used on a wide range of vehicles, there are a number of parameters that can be adjusted to your particular requirements.

Some of these parameters only need to be set once, when C-dash is installed. However, you may wish to adjust parameters such as the RPM over-rev light more frequently.

The table below shows how Parameter values are organised in Setup Groups. The table on the next page summarises the C-dash remote button operations for editing parameter values in Setup mode.



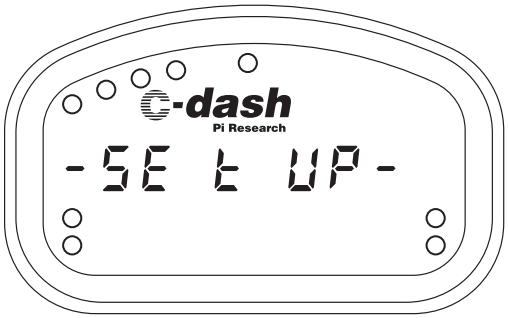
NOTE: Repeat the steps for setting parameter values as often as necessary before saving the current settings. We suggest you setup the Unit parameters first.

To do this:	***Do this:***
Enter Setup mode:	*Press and Hold* MODE/LAP *and* CHANNEL *buttons together*
Step through Setup groups:	*Click* CHANNEL
Inspect or alter a Setup group:	*Press and Hold* CHANNEL
Step through Parameter values:	*Click* CHANNEL
Increment values:	*Click* MODE/LAP
Auto-adjust values:	*Press and Hold* MODE/LAP
Save the current settings within each Setup group:	*Press and Hold* CHANNEL
Save all current settings:	*Press and Hold* MODE/LAP *and* CHANNEL *buttons together*

Entering Setup mode

The vehicle must be powered up, stationary and in Realtime mode. You cannot access Setup mode from Race mode.

1 Press and Hold the CHANNEL and MODE/LAP buttons for two seconds.



The dash shows the Setup Page for a few seconds and then shows the first Setup Group, Units.

Selecting a Group

1 Click the CHANNEL button to cycle through the Groups.

Stop on the one you want to view or change.

2 Press and Hold the CHANNEL button.

Selecting a Parameter

1 Click the CHANNEL button to cycle through the parameters until you reach the one required.

You can either Alter or Inspect a parameter:

Altering a parameter

There are two ways to alter the value of a parameter once you have selected it: Step mode and Auto-adjust mode.

Step mode

Step mode is most suited to values that have a small range, or only switch from Yes to No.

1 Click the MODE/LAP button to increment the value of a parameter one step at a time.

Auto-adjust mode

This mode is most suited to parameters that have a wide range of values, such as temperatures or tyre diameter.

1 First Press and Hold the MODE/LAP button.

If auto-adjust is available for a parameter, the digits will start to flash between 0 and 9.

2 Click the MODE/LAP button to freeze each digit at its correct value, starting with the left-most digit.

Once all the digits have been frozen, auto-adjust mode ends automatically.

NOTE: If you make a mistake, click the CHANNEL button until the parameter reappears, and the start adjusting the value again.

To Inspect or Alter other parameters in the Group

1 Click the CHANNEL button.

To Return to the Setup Groups

1 Press and Hold the CHANNEL button to return to the Setup Groups.

You can then select another Group of parameters or leave Setup mode.

To leave Setup mode

To save the parameters and exit from Setup mode:

1 Return to the main Setup Groups.

2 Press and Hold the CHANNEL and MODE/LAP buttons for two seconds.

To Exit without saving changes

If you make a mistake or change your mind, you can restore the previously stored settings by switching off the dash (e.g. with the master switch) before exiting Setup mode.

Units

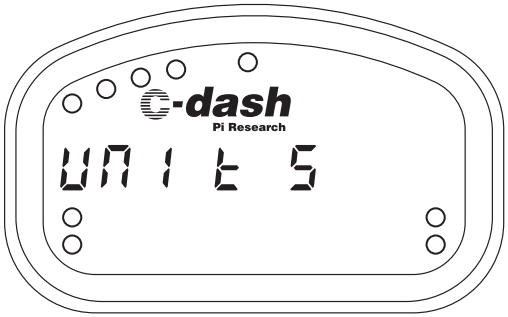
The following parameters may be measured in various units. Select the ones you prefer when setting the dash.

Setup	Options	Default
Units		
Speed	KPH/MPH	MPH
Oil/Water temperature	°C/°F	°C
Fuel pressure[1]	PSI/KGF/bar/Tbar	PSI
Oil pressure[2]	PSI/KGF/bar/Tbar	PSI

[1] Fuel Pressure not shown when Gear Numbers have been set in Options.

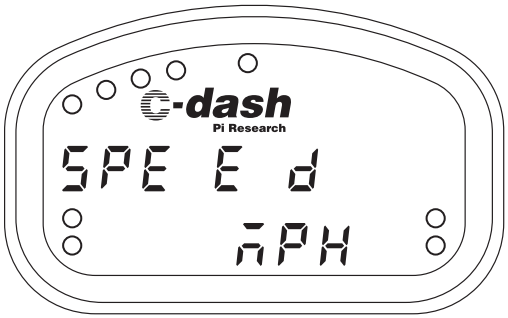
[2] Oil Pressure not shown when the RTD option has been set to either °C or °F in Options.

The Units setup page is momentarily displayed, and then the next Units setup page, Speed is displayed.



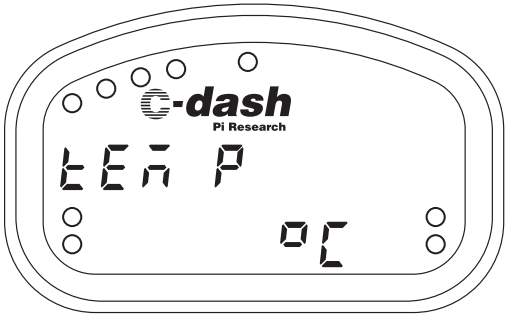
Speed

Set the Speed units to either miles per hour (mph) or kilometres per hour (kph).



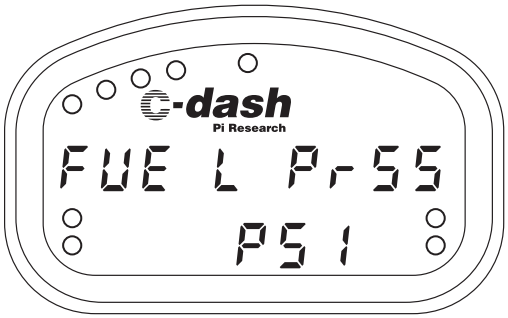
Oil/Water Temperature

Set the Temperature units to either Celsius (°C) or Fahrenheit (°F).



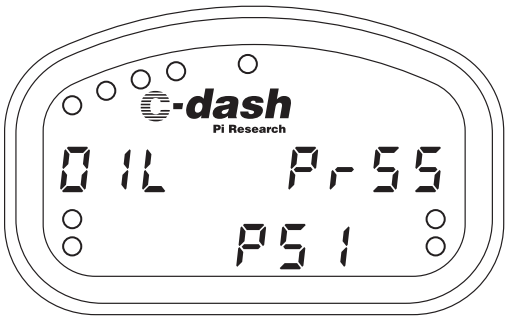
Fuel Pressure

Set the Pressure units to either pounds per square inch (psi), kilogram force (kgf), 100,000N/m^2 (bar), or Tbar (bar) for turbo sensors (0 to 2.5 bar).



Oil Pressure

Set the Pressure units to either pounds per square inch (psi), kilogram force (kgf), 100,000N/m^2 (bar), or Tbar (bar) for turbo sensors (0 to 2.5 bar).



Alarms

You must set the values for the following parameters as the *highest value* allowable before an alarm is triggered:

- Oil temperature
- Coolant temperature

You must set the values for the following parameters as the *lowest value* allowable before an alarm is triggered:

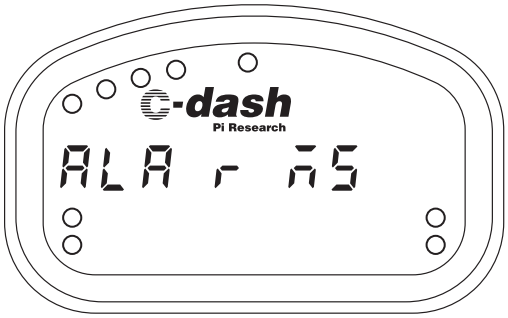
- Oil pressure
- Fuel pressure
- Battery voltage

NOTE: If either pressure channel is setup as a turbo channel, the respective pressure alarm LED can be set to come on when the turbo drops below a given value.

Setup	Min.	Max.	Default
Alarms			
Oil temperature	0	999	100
Coolant temperature	0	999	100
Oil pressure	0	999	100
Fuel pressure	0	999	100
Battery	0	20.0	100
RTD temperature*	0	999	100

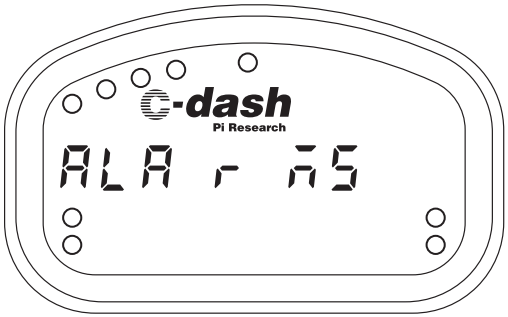
* Appears instead of Oil Pressure alarm when the RTD option has been set to either °C or °F in Options.

Alarms setup page



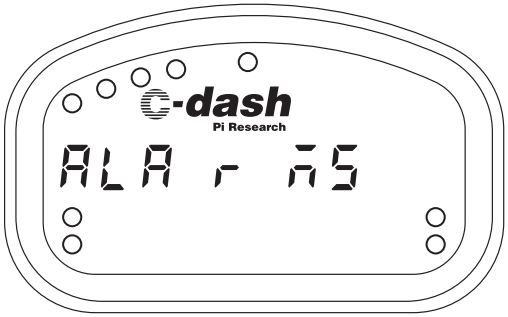
Oil temperature alarm setup page

Sets the threshold for the oil temperature alarm. The temperature scale (°C/°F) is the one set in the Units group.



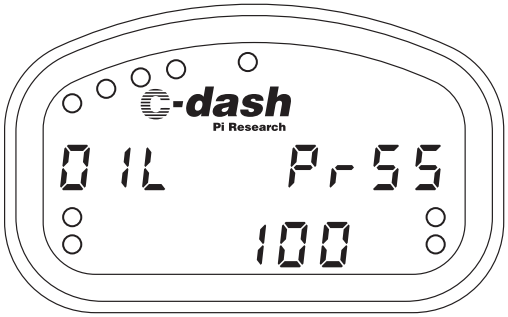
Coolant temperature alarm setup page

Sets the threshold for the coolant temperature alarm. The temperature scale (°C/°F) is the one set in the Units group.



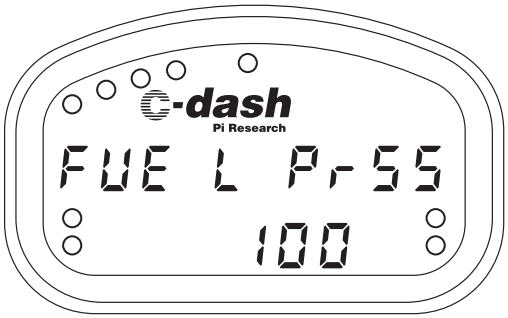
Oil pressure alarm setup page

Sets the oil pressure alarm threshold. The pressure scale (psi/KGF/bar/tbar) is the one set in the Units group.



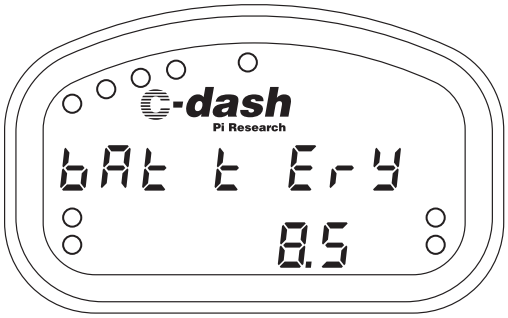
Fuel pressure alarm setup page

Sets the fuel pressure alarm threshold. The pressure scale (psi/KGF/bar/tbar) is the one set in the Units group.



Battery voltage alarm setup page

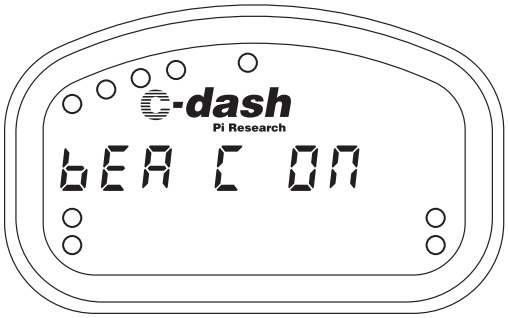
Sets the battery voltage alarm threshold.



Beacon

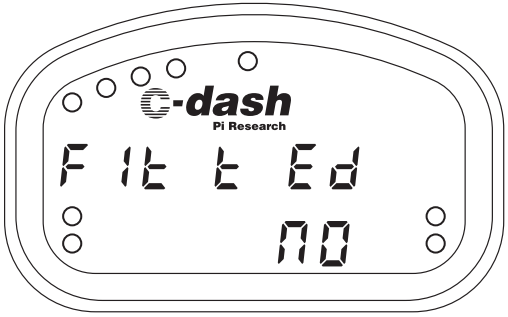
Use these options to set the Beacon parameters.

Setup	Options	Default
Beacon		
Fitted	No/Yes	No
Mode	Fix/Run	Fix
Beacon type	Sys1/Sys2	Sys2



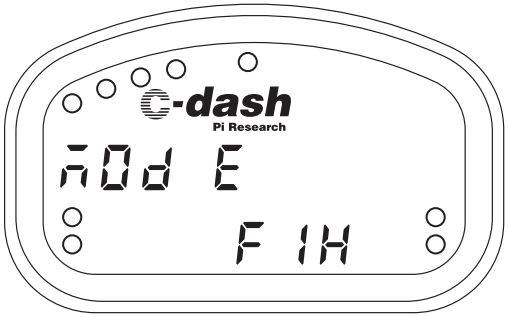
Beacon fitted

If you have the Beacon kit installed, set this option to YES to detect Beacon pulses.



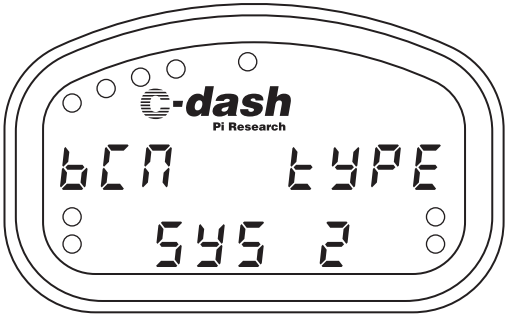
Mode

The lap timer can be setup to show the lap time for the previous lap (Fix), or as a running timer (Run).



Type

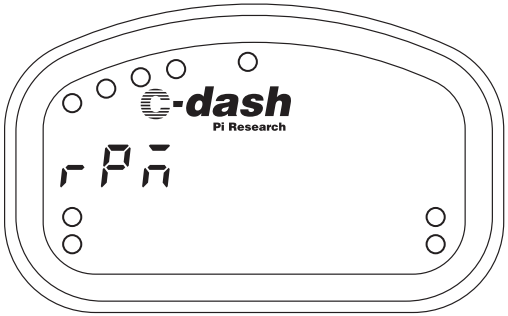
Select the type of beacon you have fitted. Choose between System 1 beacon detector or System 2 beacon detector.



RPM

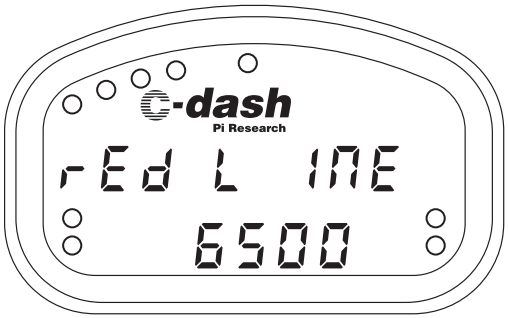
Use these options to set red line value (or Overrev), number of ignition pulses and redline alarm duration. Instructions on setting up the RPM are included in the Installation Notes.

Setup	Min.	Max.	Default
RPM			
Red line (rpm)	0	99,999	6,500
Pulses (4 stroke)	0	16	4
Over rev light duration	0.01	2.0	0.01
Telltale type	RPM/Speed		RPM



Red line

Sets the RPM value at which the red line (over rev) alarm light on the display triggers.

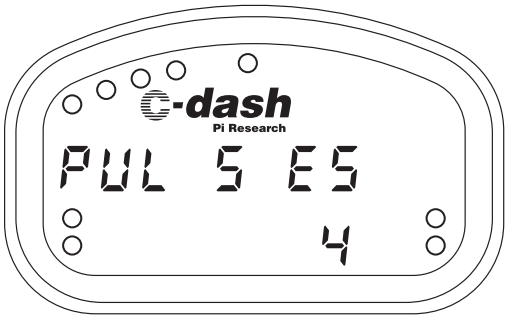


The four orange LED Gear change lights illuminate at intervals of 200 rpm below the redline setting. e.g. If the Redline is set to 6500 rpm the first LED illuminates at 5700 rpm, the second at 5900 rpm, the third at 6100 rpm, the fourth at 6300 and the RPM Redline alarm LED illuminates at 6500 rpm. This is illustrated in the next table.

rpm	Orange LEDs	Redline red LED
5700	● ○ ○ ○	○
5900	● ● ○ ○	○
6100	● ● ● ○	○
6300	● ● ● ●	○
6500	● ● ● ●	●

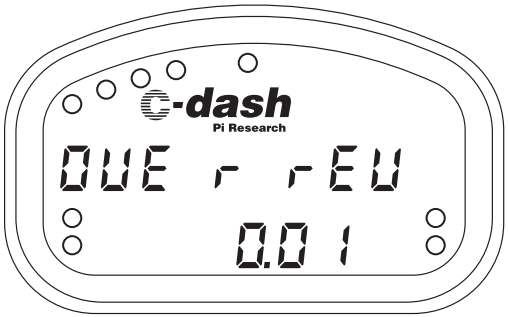
Pulses

Sets the number of ignition pulses per TWO revolutions of the engine.



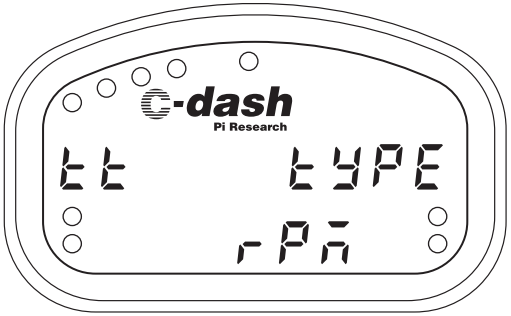
Overrev Light Duration

Sets how long the Red line (over rev) alarm light on the display stays on.



Telltale type

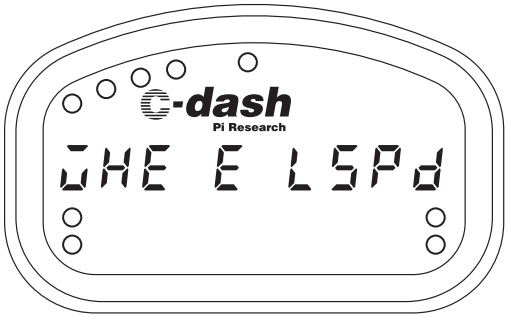
Sets whether the RPM maximum telltale value is latched on the maximum RPM or maximum Speed.



Wheelspeed

Use these options to set tyre diameter, number of wheelspeed triggers on a wheel and the Out speed value.

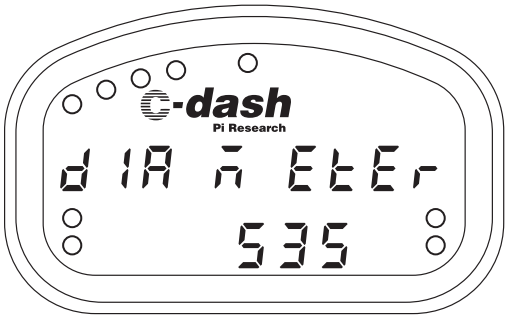
Setup	Min.	Max.	Default
Wheel speed			
Tyre diameter (mm)	1	999	535
Triggers (per rev)	1	100	2
Outing start speed	0,2,20,40,80,112	112	20



Tyre diameter

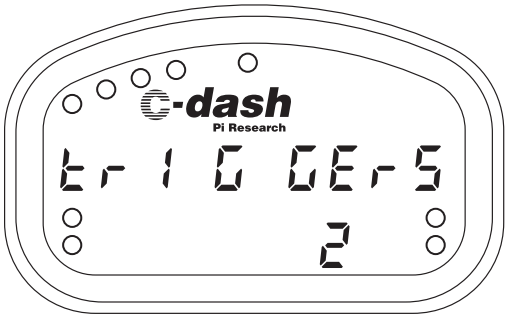
Sets the tyre diameter (in millimetres) on which the wheel speed trigger is mounted.

NOTE: Take special care in measuring the tyre diameter since this setting affects the accuracy of all speed readings.



Triggers

Sets the number of speed triggers that are fitted on the wheel.



Out start speed

Sets the speed that must be exceeded before the C-dash switches to Race page and recording of telltales starts. This will vary according to your vehicle, but should be greater than the speed reached when you drive around the pits or garage areas.

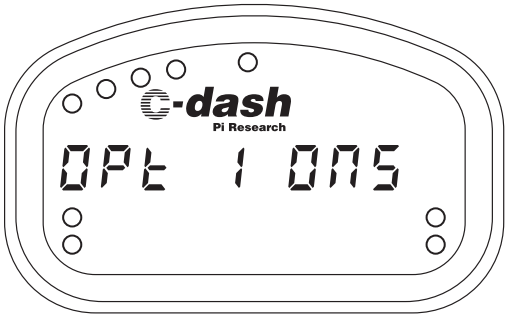
Options

Sets display brightness minimum value, Latched or Realtime speed, C-dash type, Gear number and RTD options.

Setup	Min.	Options	Default
Options			
Brightness	10%	100%	50%
Speed	Latch max speed	Realtime	Latch
Type[1]	SO/S1/S3/EO[2]/Mbe/Pectel		SO
Gears	no	2,3,4,5,6,7,8	no
RTD option	no/°C/°F		no

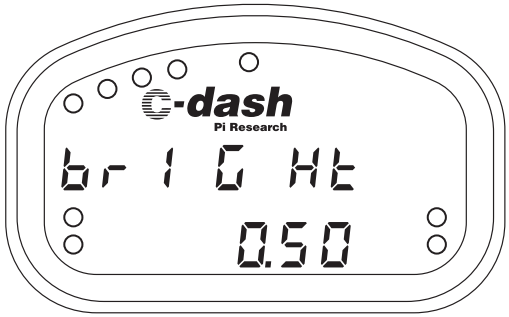
[1]SO is Standalone, S1 is System 1, S3 is System 3, EO is ECU Out option, Mbe is Mbe ECU and Pectel is Pectel ECU.

[2]The ECU Out option enables the C-dash to give an output data stream that can be connected to a second C-dash (either directly or via a Telemetry radio). Both C-dashes will then dispaly the same information.



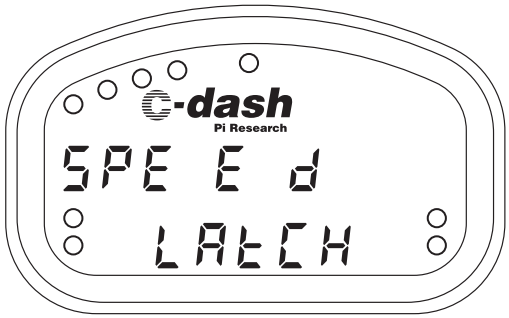
Brightness

Sets the minimum brightness of the all the LEDs and LED displays on the dash. Once set in Setup, it can be controlled by a switch or a variable resistor. A switch can be used to select either the set minimum or the maximum brightness. A variable resistor can be used to vary the brightness between the set minimum and maximum brightness.



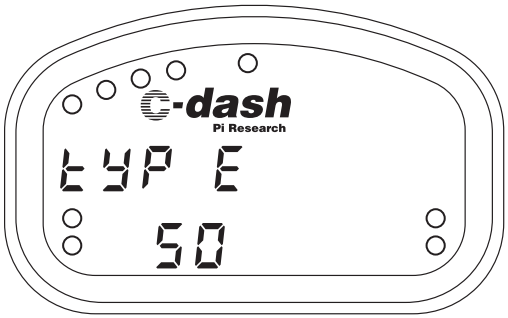
Speed

Sets the speed to be Latched or Realtime. Latched will display the maximum speed and minimum speeds reached. Realtime will display maximum speed and Realtime speed on the Race Page.



Type

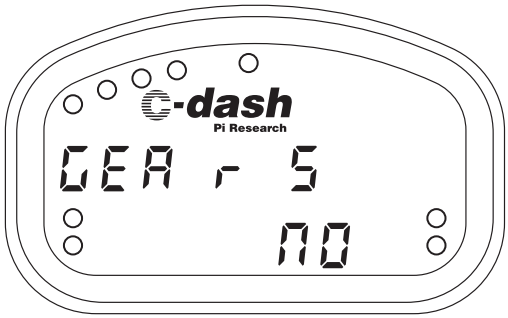
Sets C-dash to function as a standalone dash or as a display for a Pi System or ECU data.



SO is Standalone, S1 is System 1, S3 is System 3, EO is ECU Out option, _bE is Mbe ECU and PECtEL is Pectel ECU.

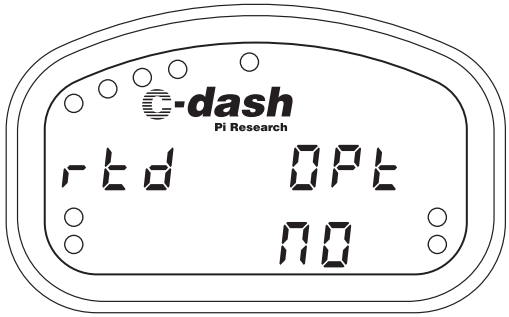
Gear Number

Use this option to set up the number of gears you have, and the input values for each gear.



RTD option

Setting this option to °C or °F replaces the Oil Pressure channel with an RTD temperature sensor channel.

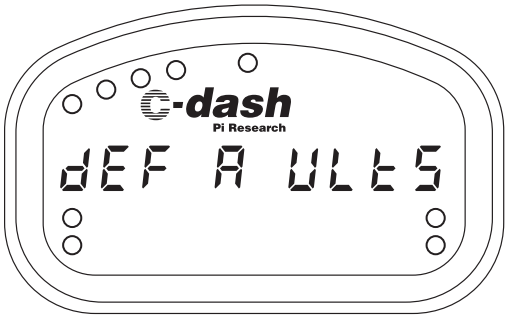


Defaults

Resets ALL settable parameters to their default values.

Setup

Default	
Defaults	Select to reset **ALL** parameters to their default settings
Confirm	Select to confirm reset of all paramters to the default settings



Using the C-dash

Realtime mode

This section gives you step-by-step instructions on how to use the dash. It can be used for reference once you have understood the concepts described in the sections *Overview* and *At the Track*.

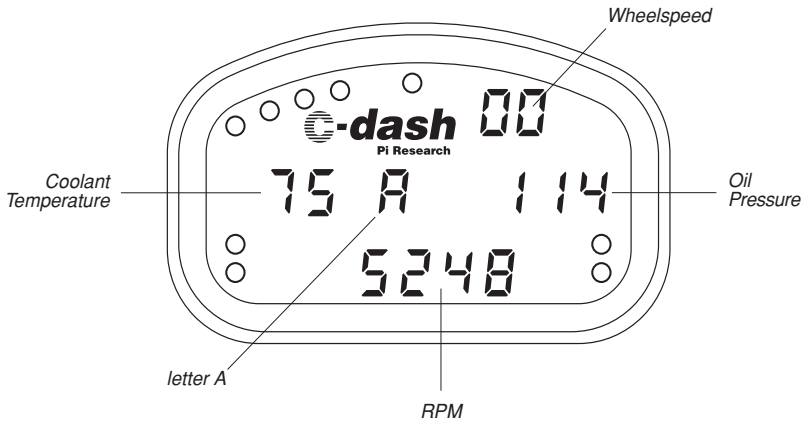
In Realtime mode the C-dash displays values from sensors, but data for Telltales is not recorded. Once you exceed the Out speed and have a valid RPM, the C-dash automatically switches to Race mode and begins recording Telltale data.

MODE/LAP button

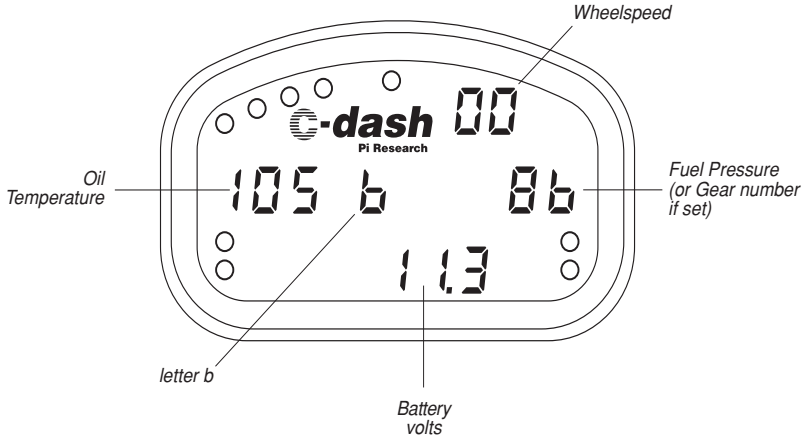
- Click the MODE/LAP button to switch between the two Realtime pages.

The two Realtime Pages display data as shown in the next two figures.

Realtime Page A

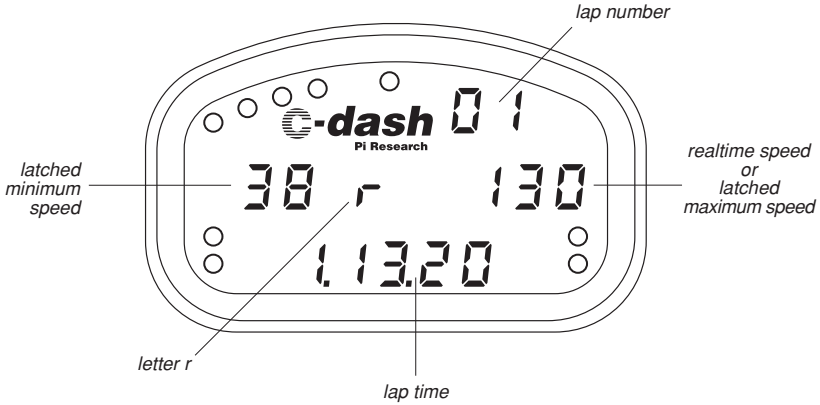


Realtime Page B



Race mode

Race mode is similar to Realtime mode except that recording of telltales takes place during Race mode (this is triggered by driving the vehicle above its Out speed).



The CHANNEL button

- Click the [CHANNEL] button to cycle through the two Realtime pages and the Race page.

Alarms

- Click the [MODE/LAP] *or* [CHANNEL] buttons to clear an Alarm signal.

Alarms

The C-dash will trigger an alarm if thresholds for any of the following parameters are exceeded:

- Maximum Coolant temperature
- Maximum Oil temperature
- Minimum Oil or turbo pressure
- Minimum Fuel or turbo pressure
- Minimum Battery voltage

When an alarm is triggered, the respective alarm light is illuminated. An alarm message and the value of the parameter causing the alarm are also displayed. The message is the same as that displayed when setting the alarm thresholds in Setup mode.

After an Alarm has been generated, the thresholds are automatically adjusted after 30 seconds (until the dash has been reset), preventing alarms from re-triggering after a spin:

- Temperatures +5°C
- Pressures –5psi
- Battery Voltage –0.5V

Alarm prevention

To prevent alarms being set off unnecessarily, they are only triggered in Race Mode.

Note: If a wheelspeed sensor is not fitted, Alarms will not be triggered.

Setting Alarm thresholds

You can set the Alarm thresholds when the C-dash is in Setup mode; see the *Setup* section.

Telltale mode

The dash automatically enters Telltale mode after the vehicle has been driven and the RPM and Speed are zero. Three pages of Telltale information are available. Telltales Page C is the default page and is displayed when the C-dash enters Telltale mode.

Telltales Page C shows the minimum speed, maximum speed and lap time for the fastest lap of the outing. You can scroll through all the laps on Telltales Page C or change to another Telltales page and scroll through the displayed information for all the laps.

The CHANNEL button

- Click the CHANNEL button to cycle through the Telltales pages.

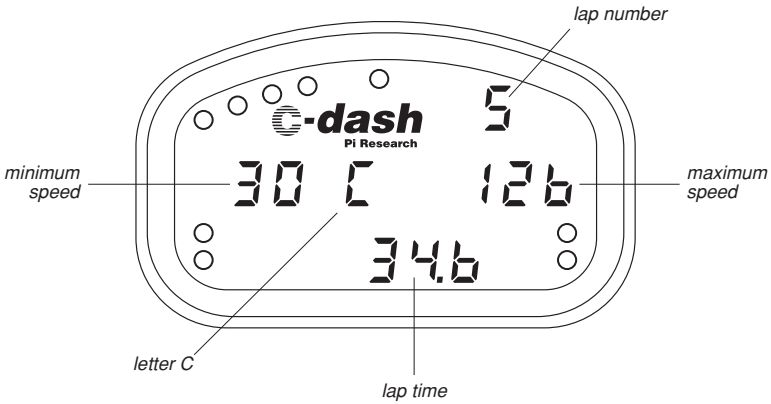
The MODE/LAP button

- Click the MODE/LAP button to move to the next lap on a page.

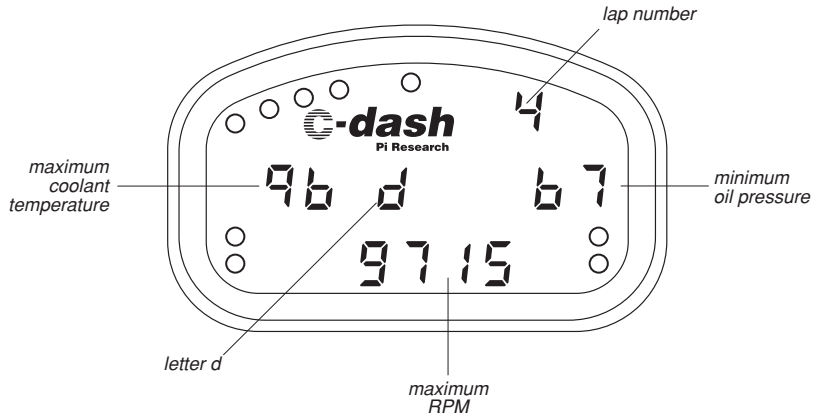
*NOTE: The first lap driven in an outing is always called the **Out** lap. The last lap driven in an outing is always called the **In** lap.*

Telltales pages

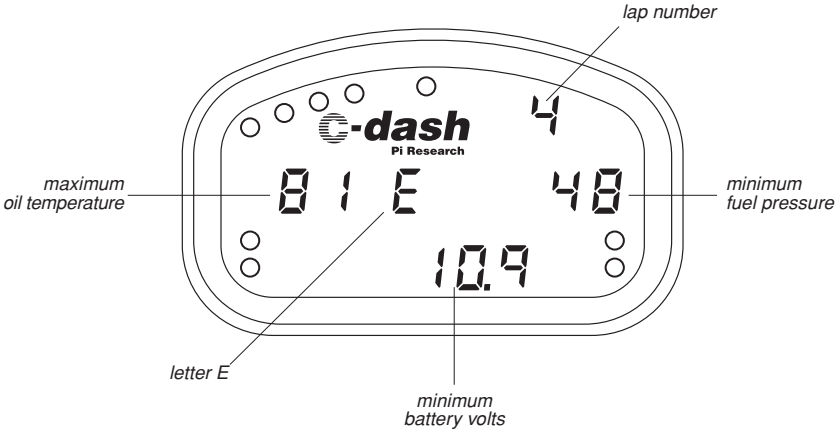
Telltales Page C



Telltales Page D



Telltales Page E



At the Track

Initial checks

This section takes you through a typical day of using a C-dash.

If you have not used a C-dash before, you may need to refer to the *Setup* and *Using the C-dash* sections.

Kit list

For a typical day using C-dash:

If you have a Beacon kit, you will need:

- the Beacon transmitter and power lead
- a battery to run the Beacon transmitter (7.2V for a System 1 beacon or 12V if you are using System 2 beacon).

Note: A master Beacon transmitter, set to channel 0, is installed at major tracks in the UK. To use this transmitter you must set your beacon detector to channel 0. You do not then need to use your own beacon transmitter.

In case of accident damage, we suggest you have:

- a basic toolkit (including crimping tool)
- a spare wheel speed sensor
- a spare temperature sensor
- a spare pressure sensor.

Checklists

Before each outing, check that:

- the C-dash is powered up
- the C-dash has been setup properly for the vehicle
- the sensors are working properly (click the MODE/LAP button to switch between Realtime Page A and Realtime Page B to check the sensor values, e.g. car battery voltage, or RPM)
- the wheel speed sensor is adjusted correctly (spin the wheel) and view Realtime Page A—the decimal points in display field 2 are illuminated when the sensor detects a trigger
- the sensor wiring has not been damaged, if you've been working on the vehicle.

If you have a Beacon kit, check that:

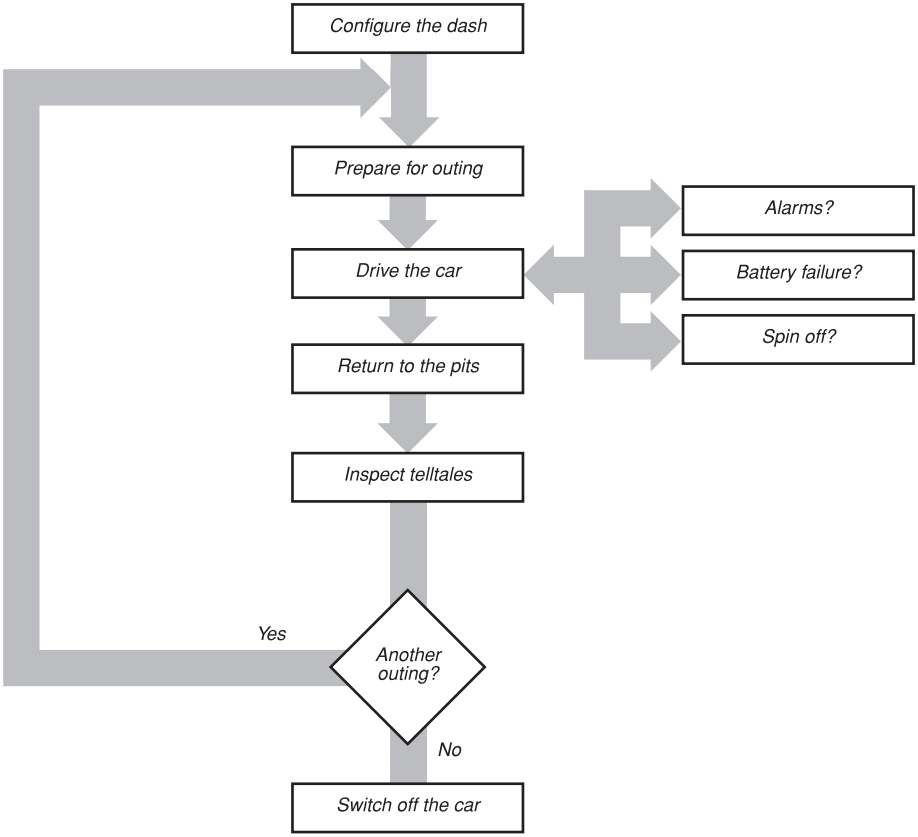
- the Beacon transmitter is wired up and working (check the front light on the transmitter)
- the Beacon transmitter and detector are set to the same channel
- the Beacon detector is working (wave the transmitter in front of it and check that the decimal points in display field 5 are illuminated when a Beacon transmitter signal is detected)
- the beacon transmitter is placed on the pit wall at the same height as the detector
- the battery is fully charged
- you remember to pick up your transmitter after the race!

NOTE: The lap times are stored in the C-dash, not in the Beacon transmitter. This means that all the cars in your team can use the same Beacon channel with a single transmitter.
Each time you visit a circuit, try to place the transmitter at exactly the same place on the pit wall.
A master Beacon transmitter, set to channel 0, is installed at major tracks in the UK. To use this transmitter you must set your beacon detector to channel 0. You do not then need to use your own beacon transmitter.

A typical day...

Once you have completed the check lists, you are now ready to go.

The diagram below shows a typical day's use of a C-dash. (The C-dash will normally have been correctly installed and setup for your vehicle.)



Powering up the C-dash

Turn on the master switch (and ignition switch, if necessary) to power up the C-dash. The C-dash starts up in Power up mode and after a selftest lasting a few seconds, changes to Realtime mode Page A.

Check the setup of the C-dash

The first time you use the C-dash, check that it is correctly setup (see the *Setup* section).

Warming up the car

1 Start the engine.

Use the C-dash to monitor temperatures and pressures whilst you warm the vehicle up in the pits.

2 Click the MODE/LAP button to switch between Realtime Page A and Realtime Page B.

Realtime Page A shows:

- wheelspeed (2 digits only)
- coolant temperature
- oil pressure
- RPM.

Realtime Page B shows:

- wheelspeed (2 digits only)
- oil temperature
- fuel pressure
- battery volts.

Driving the car

The car is now ready to drive.

As you leave the pits and pass the outing speed, the C-dash switches to the Race page and starts recording data for the Telltale pages. The C-dash can record data for a maximum of 45 laps.

Race page shows:

- lap number
- minimum latched speed
- real time speed or latched maximum speed (depends on which option was selected in Setup Mode)
- lap time.

To return to Realtime Page A or Realtime Page B at any time:

1 Click the CHANNEL button until the page you want is displayed.

Lap Times

As you drive past the Beacon transmitter on the pit wall, the time for your last lap appears on the Race page. Race page also shows a lap count.

Note: If a wheelspeed sensor is not fitted, Lap Times will not be displayed.

Spinning off

If you spin off and do not stall the engine, the C-dash remains in Race mode and continues to record telltale data.

If you stall the engine and the car stops, the C-dash will switch to Telltale mode. If you then restart the engine and start moving again, once the Out speed has been exceeded, the C-dash automatically switches back to Race mode. ALL previous telltale data is lost and the C-dash starts recording new telltale data as though it were on a new Outing.

Alarms

An important feature of the C-dash is the ability to warn you if there is anything wrong with the parameters it is monitoring (e.g. loss of oil pressure).

The thresholds at which the alarms go off are set in Setup mode.

If an alarm condition is detected, an Alarm light goes on and a message appears on the display. If the alarm comes on, and stays on (e.g. there is an oil leak):

1 Click *either* CHANNEL or MODE/LAP button to reset the alarm.

If an alarm has been triggered, the threshold for that alarm is automatically adjusted for the remainder of the outing, to prevent it from re-triggering immediately. The automatic adjustment values are +5°C for temperature alarms, –5psi for pressure alarms and –0.5V for the battery voltage alarm. If the reading is still significantly in error from the automatically adjusted threshold, the alarm will continue to be generated and must be reset each time until enough resets have been made to ensure that the reading no longer exceeds the threshold setting.

If the problem (e.g. low fuel pressure) is temporary, the alarm will reset itself and the threshold will **not** be adjusted.

NOTE: After a manual reset, alarm thresholds are reset to their original value only when the C-dash is reset.

Battery alarm

C-dash requires a minimum battery voltage (7.0V) in order to operate. If the vehicle battery delivers less than this, the Battery alarm will alert you when the battery is running low. The threshold for the Battery alarm can be set in Setup mode.

Returning to the pits

Inspecting telltales

When you stop and switch the engine off the C-dash automatically changes to Telltale mode, and displays Telltale Page C. The data displayed on Telltale Page C is for the fastest lap in the outing.

The highest maximum value and lowest minimum value for the parameters for an outing on each telltale page are shown when the Lap number field displays ***tt***.

Telltale Page C displays the following parameters for the *fastest lap* of the outing:

- Lap number
- Lap time
- Minimum speed
- Maximum speed.

You can then choose to scroll through the above parameters for all the laps in the outing, or choose to view the remaining two Telltale Pages.

1 Click the MODE/LAP button to change the lap.

or

2 Click the CHANNEL button to select Telltale Page D.

Telltale Page D displays:

- Lap number
- Maximum coolant temperature
- Minimum oil pressure
- Maximum RPM.

3 Click the MODE/LAP button to change the lap.

or

4 Click the CHANNEL button to select Telltale Page E.

Telltale Page E displays:

- Lap number
- Maximum oil temperature
- Minimum fuel pressure
- Minimum battery voltage.

5 Click the MODE/LAP button to change the lap.

Switching off the car

Once the car has come into the pits and you have checked the Telltale Pages, it is safe to turn off the C-dash.

Note: Removing power from the C-dash will destroy the Telltale data recorded in the C-dash.

Troubleshooting

Until you are completely familiar with your C-dash, you may encounter difficulties. This Section lists the most common sources of problems and how to correct them.

If the remedies suggested have no effect, please contact Pi Research.

WARNING: Do not attempt to repair Pi Research equipment yourself. The Warranty will be invalidated if any parts of the system have been tampered with.

C-dash

Problem **The dash doesn't start up**

Cause No supply voltage
Action Check the car's master switch and ignition switch.

Cause Flat battery
Action Make sure the car battery is charged up and connected.

Cause The connector on the dash is not secured.
Action Check the connectors in the back of the dash are properly located.

Cause Faulty wiring
Action Check that the supply voltage wiring is not damaged or has been shorted out. (Refer to the Pin connection table in the 'Installation Notes' section.)

Problem **The dash blanks out**

Cause Supply voltage is dropping below 7 volts
Action Check the battery is well charged.

Problem **The dash blanks out during use**

Cause Excessive electrical noise
Action Check earthing of ignition or contact Pi Research

Cause Faulty wiring
Action Check that the supply voltage wiring is not damaged or has been shorted out. (Refer to the Pin connection table in the 'Installation Notes' section.)

Remote push buttons

Problem **One remote button doesn't work**

Cause Faulty wiring

Action Refer to the Installation Notes to check the wiring to the Switches.

Cause Faulty button switch

Action Try swapping the button switches to see if that cures the problem. If so, change the faulty one.

Engine speed (RPM)

The C-dash

Problem **The dash is reading half the correct RPM value**

Cause The Pulse setting in the dash is wrong

Action Check and adjust the value in Setup mode.

Problem **The Redline needs to be adjusted**

Cause The Redline setting in the dash needs to be adjusted

Action Check and adjust the value in Setup mode.

Tacho signal

Problem **Unstable or absent RPM reading**

Cause The wiring is picking up noise from other sources on the car

Action Check whether the tachometer wiring runs close to other ignition circuits and re-route it if necessary.

Cause Wiring fault

Action Check that the tachometer signal from the ignition box (NOT the HT or LT ignition signals) is connected to pin 2 of the 3-way RPM connector on the loom.

RPM Box (HT or LT mode)

Problem **The RPM readout is blank or intermittent**

Cause The loom connection to the RPM Box may be faulty

Action Inspect the 3-way connector on the RPM Box or System loom and repair, if necessary.

Problem **The RPM reading is occasionally spiky**

Cause The wiring is picking up noise from other sources on the car

Action Check whether the RPM wiring runs close to other ignition circuits and re-route it, if necessary

RPM Box HT (High Tension) Connection

Problem **The RPM reading cuts out or flashes at high RPM**

Cause The RPM Box is not setup correctly

Action Check that the RPM Box is set for HT (positions 8 to F), and for the maximum sparks per minute that can be emitted by the ignition system.

Problem **The RPM readout is unstable**

Cause The HT connection on the RPM Box may be faulty

Action Inspect the wiring on the HT lead and repair, if necessary.

Problem **The RPM reading is obviously too low**

Cause The HT pickup has been wrapped around an HT lead to an individual cylinder instead of the main HT lead and is not picking up the sparks for the other cylinders

Action Wire the HT pick-up around the main HT lead.

NOTE: Some engines now have multi-coil systems, where each cylinder has its own coil. In these cases, you can use the HT lead from one coil if the PULSE value on the dash is adjusted accordingly (see the 'Installation Notes' section); alternatively, you could use the LT signal from the ignition box and drive the RPM Box in LT mode.

RPM Box LT (Low Tension) Connection

Problem **The RPM readout cuts out or flashes at high RPM**

Cause The RPM Box is not set up correctly

Action Check that the RPM Box is set for LT (positions 0 to 7), and for the maximum sparks per minute that can be emitted by the ignition system.

Problem **The RPM readout is unstable**

Cause The LT connection on the RPM Box may be faulty

Action Inspect the wiring on the LT connections and repair, if necessary.

Problem **The RPM readout is unstable**

Cause The polarity of the LT connection may be wrong. There are normally three connections on the coil: HT, supply and trigger. The trigger can either be switched to ground or switched to +12V.

Action Connect the RPM Box in line with the other low tension side of the coil (e.g. supply or trigger). This will reverse the polarity of the signal going through the box.

Speed

Problem **The speed reading doesn't work at all**

Cause If it has never worked, the wheel speed sensor may need adjusting

Action The sensor must be set within 0.4 to 0.8 mm from the triggers on the wheel.

WARNING: DO NOT OVER-TIGHTEN THE WHEELSPEED SENSOR – it will break. Nip the lock nuts up with a spanner. You are advised not to use a socket set.

IMPORTANT: Although the wheelspeed sensor may appear to work at low speeds, unless the sensor is set within 0.4 and 0.8 mm, the sensor may not work at high speed.

Problem **The wheelspeed sensor has been adjusted but it won't work**

Cause Faulty sensor

Action Visually inspect the wheelspeed sensor for any damage to the head (too close to trigger) or body (over-tightened). Replace if necessary.

Cause Faulty wiring

Action See the 'Installation Notes' section for details on how to check the wiring for damage.

Problem **The wheelspeed is wrong (e.g. by a factor of 2 or 4)**

Cause The sensor is not picking up all the triggers on the wheel

Action Check that all the triggers are set within 0.4 and 0.8mm from the sensor.

NOTE: Because of the tolerance on the suspension of some saloon cars, it is very hard to set up multiple targets within 0.5 mm. In this case, it is best to use a single trigger.

Cause The wheelspeed Pulse setting is wrong

Action Check and adjust the value in Setup mode.

Problem **The wheelspeed reading seems inaccurate (e.g. by 5 percent)**

Cause The Tyre diameter setting is wrong

Action Check and adjust the value in Setup mode. This should be the actual rolling diameter of the tyre when it is under load.

Using an ABS speed sensor…

Problem **The wheelspeed appears incorrect when using an ABS sensor interface box**

Cause The number of triggers and/or the tyre diameter set in the dash may be wrong

Action Check the number of triggers on the ABS sensor wheel and set up the dash

Cause The ABS interface box is earthing to the chassis

Action Do not connect any of the wires from the interface box directly to the chassis

Cause The ABS sensor is also trying to drive the car's ABS system

Action Isolate the interface box wiring from the ABS system with 100µF capacitors as described in the 'Installation Notes' section.

Using the waterspeed sensor…

Problem	**The water speed appears incorrect**
Cause	The number of triggers and/or the tyre diameter settings in the dash may not be providing a correct calibration with the boat speed
Action	Adjust the value used for tyre size to change the speed displayed by the dash (try 650mm and 20 pulses per rev). The speed can be calibrated against a hand-held GPS unit.

Problem	**The waterspeed trace is very 'noisy' even when the boat is in smooth water**
Cause	The sensor may have been mounted on the hull in such a way that it picks up turbulence from the prop or fins on the hull
Action	Try mounting the sensor in a different position on the hull as indicated in the installation section
Cause	The sensor may be mounted too high on the hull and is being driven by the air flow under the hull
Action	Move the sensor lower on the hull.

Using the wheelspeed selector box…

Problem	**The speed information is corrupted**
Cause	The wheelspeed selector box is picking up noise from the chassis
Action	Do not connect the supply 0V (Pin G on the selector box) if the ABS sensors are earthed to the chassis
Cause	The power supply is being taken directly from the battery
Action	The 12V supply (Pin J on the selector box) should come from the C-dash and not directly from the vehicle battery

Lap times (Beacon)

If you have not purchased a Beacon kit for your C-dash, the dash cannot show lap times.

To test the Beacon system, turn on the C-dash and beacon transmitter and wave the beacon transmitter in front of the detector on the car. The lap times on the C-dash should change.

Problem **Lap times don't appear on the dash**

Cause The C-dash must be configured to use a Beacon
Action Check and adjust the setting in Setup mode.

Problem **Lap times aren't working (dash shows 0.00)**

Cause The Beacon transmitter isn't being powered; the LED on the Beacon transmitter isn't on
Action Make sure the battery wiring is secure, and that the battery is fully charged (12V).

NOTE: Although a lit LED on the transmitter indicates a good connection to the battery, only a fully recharged battery will supply a strong signal to the car. Make sure you recharge the battery before a day at the track.

Cause The channels are not correctly set
Action Make sure that the Beacon transmitter (on the pit wall) and detector (on the car) are set to the same channel. They both have a switch with positions 0 to 9

Cause The transmitter and detector are not lined up correctly
Action As the car passes the transmitter, make sure that there is a clear line-of-sight between the two.

Cause Sunlight is dazzling the detector
Action The sun – a large infrared Beacon transmitter! – should not shine into the detector as it passes the pits. Place the detector on the other side of the car and move the transmitter to the other side of the track.

Problem **Lap times are being corrupted**

Cause If the wheelspeed sensor is not set up properly, the dash will occasionally read zero road speed and insert pit stops in its data. This shows up with very short lap times (e.g. 2 seconds).

Action Check and adjust the wheelspeed sensor (see section on wheel speed troubleshooting).

Problem **The lap times seem wrong**

Cause The car may be picking up someone else's Beacon signal.

Action Check if any other teams are running with the same type of Beacon transmitter on the same channel and agree to use different channels.

Temperatures

When measuring temperatures with a thermocouple ...

Problem	**The thermocouple readings are noisy**
Cause	The thermocouple amplifier box is picking up electrical noise from the chassis
Action	Make sure the thermocouple amplifier box is not electrically connected to the chassis.
Cause	The amplifier is picking up electrical noise from the chassis
Action	Make sure the leads for the thermocouple probe and amplifier do not pass close to high voltage sources such as the ignition coil or magneto.

Pressures

Problem	**The pressure readings are wrong**
Cause	The pressure sensor is faulty
Action	Check that the connectors on the pressure sensors are correctly fitted, and going to the right sensor. If necessary, change the pressure sensor.
Cause	The pressure sensor wiring is damaged
Action	Check the wiring on the car for visible damage and repair where necessary.

NOTE: If one pressure sensor seems wrong, try putting its connector onto the other sensor. If the fault moves with the connector, then the wiring or dash is faulty. If the fault does not move with the connector, the pressure sensor needs replacing.

When using the turbo/carburettor pressure sensor…

Problem	**The C-dash appears to display the wrong turbo or carburettor pressure**
Cause	The C-dash and pressure sensor may be incompatible
Action	If you are using the low range pressure sensor (0 to 2.5 bar) the pressure channel units must be configured as tbar under the UNITS menu in setup mode.

Telltales

Problem	**The dash won't go into Telltale mode**
Cause	The dash cannot go into Telltale mode until the car has been driven and then stopped.
Action	Drive the car.

Appendices

Appendix A - C-dash and System 1

Introduction

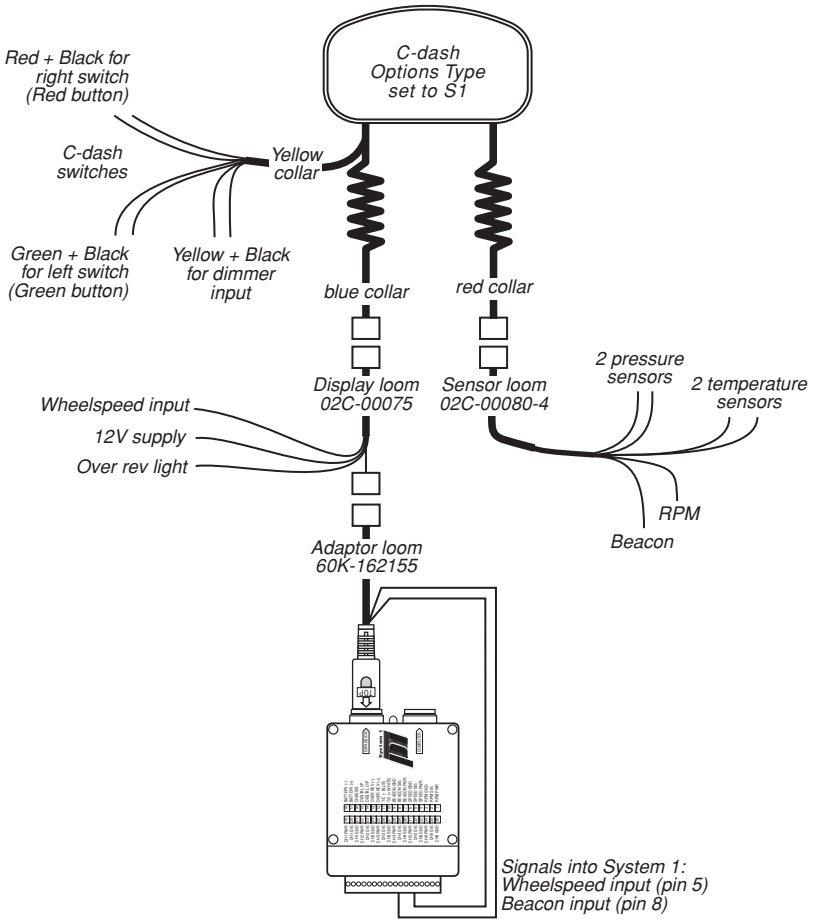
A C-dash can be used with a Pi System 1 data logger. Sensors can be connected to both the System 1 data logger and to the C-dash. Data from sensors that are connected directly to the C-dash is viewed on the C-dash and can be also be logged in the System 1.

Sensors which are connected directly to the System 1 can be logged but not viewed on the C-dash.

Pi Club Expert Windows PC software is used to select which channels to log on the System 1.

Installation of C-dash with System 1

The figure below shows the connections for the C-dash, the System 1 and sensors.



C-dash to System 1 connections

Installation information

The lists below give installation information.

Display loom connections:

- Connect a 12V supply to the flying lead labelled Power. Connect the red wire to battery +ve and the black wire to battery –ve. This only supplies power to the C-dash.
- Connect the wheelspeed sensor to the flying lead labelled WSP FL.
- If you have a remote Over Rev alarm light, connect it to the flying lead labelled Over Rev.

Sensor loom connections:

- Connect the sensors that you want to display on the C-dash (and the option to be logged in System 1) to the Sensor loom flying leads. The flying leads are labelled showing the type of sensor to be connected.

Adapter loom connections:

- Connect the flying lead labelled Beacon to the Beacon input pins on the System 1 orange connector. Refer to the System 1 User Guide.
- Connect the flying lead labelled WSP to the wheelspeed input pins on the System 1 orange connector. Refer to the System 1 User Guide.

System 1 connections:

- Connect a 12V supply to the relevant pins on the System 1 connector. Refer to the System 1 User Guide.
- Connect the sensors that you want to log **BUT** not display on the C-dash, to the relevant pins on the System 1 connector.

C-dash loom with yellow collar:

The C-dash is controlled by two remote switches. Refer to the C-dash User Guide on how to connect the C-dash switches.

The C-dash can be set so that the display can be dimmed. The setting determines what type of input is required on the yellow and black wires. Refer to the C-dash User Guide.

C-dash setup for use with System 1

To work with System 1 the C-dash Setup Options Type must be set to S1. The C-dash must also be set up for the channels you want to display. Refer to *Setup* section.

Pi Club Expert Windows

Use Pi Club Expert Windows to setup and select the channels to be logged, and to select the C-dash as the System 1 dash. Refer to the Pi Club Expert Windows User Guide.

System 1 must know if channels 1 to 4 are connected to the C-dash or directly to System 1. This is done by selecting the **Dash options** in the **Logging Setup**.

To select the dash options in the logging set up:

1. Choose **Set up ▸ Set up Logger**. Select a logger from the list in the Select Logger dialog box.
2. Click the **Dash** tab on the Logging set up dialog box and select the C Dash option.
3. Select the C-dash or System 1 options for Channels 1 to 4.

Channels 1 to 4 refer to Input 1 to Input 4 on the Analogue Channel tab on the Logging set up dialog box. These inputs have default settings which can be re-configured. The Inputs are listed in the table below.

Analogue Channels Input 1 to Input 4

Input no.	Default use	Alternate use	Channel number
1	Oil pressure	RTD input	Channel 1
2	Fuel pressure	Gear number	Channel 2
3	Water temperature		Channel 3
4	Oil temperature		Channel 4

Connector information

Display loom

The Display loom has two fixed connectors and three flying leads.

Connector types

Loom connector	Mating connector	Comment
09G-0297	09G-0298	Labelled Display. Blue collar.
09G-0297	09G-0298	Labelled Logger.

Connector labelled Display – pin information

Pin	Colour	Function	Pin	Colour	Function
1	white	System 1 to C-dash	7	red	Battery +ve (C-dash power)
2	blue	C-dash to System 1	8	red	+12V for wheelspeed
3	red	Data to PC	9	white	Over rev light signal
4	red	Data from PC	10	black	Battery –ve (C-dash power)
5	blue	Wheelspeed signal	11	black	Ground 3
6	white	Beacon from C-dash	12	black	Ground 3

Connector labelled Logger – pin information

Pin	Colour	Function	Pin	Colour	Function
1	white	System 1 to C-dash	5	red	Data from PC
2	blue	C-dash to System 1	6	blue	Wheelspeed signal
3	red	Data to PC	7	white	Beacon from C-dash
4	black	Data ground	8–12		No connection

Sensor loom

The Sensor loom has one 12-pin connector and 6 flying leads for connecting sensors. Each flying lead is labelled for the type of sensor to be connected.

Connector type

Loom connector	Mating connector	Comment
09G-0298	09G-0297	Labelled Sensors

Connector labelled Sensor – pin information

Pin	Colour	Function	Pin	Colour	Function
1	blue	Oil pressure	7	red	+12V for RPM box and Oil temp
2	blue	Fuel pressure	8	red	+12V for Beacon and Water temp
3	blue	Water temperature	9	red	+5V for Fuel and Oil pressure
4	blue	Oil temperature	10	black	Ground for Beacon
5	–	No connection	11	black	Ground for RPM box
6	blue	RPM signal	12	white	Beacon signal

Adaptor loom

The Adaptor loom has a 12-pin connector at one end and a 5-pin DIN plug at the other. The 5-pin DIN plug has two flying leads. The flying leads are labelled WSP and Beacon.

Connector types

Loom connector	Mating connector	Comment
09G-0298	09G-0297	Labelled Logger
5-pin DIN plug	5-pin DIN socket	Labelled Expansion

Connector labelled Logger – pin information

Pin	Colour	Function	Pin	Colour	Function
1–2		No connection	6	blue	Wheelspeed to System 1
3	red	C-dash to System 1 data	7	white	Beacon from C-dash to System 1
4	black	Data Ground	8–12		No connection
5		No connection			

Connector labelled Expansion – pin information

Pin	Colour	Function	Pin	Colour	Function
1	blue	Wheelspeed to System 1	4	white	Beacon from C-dash to System 1
2		No connection	5	black	Data Ground
3	red	C-dash to System 1 data			

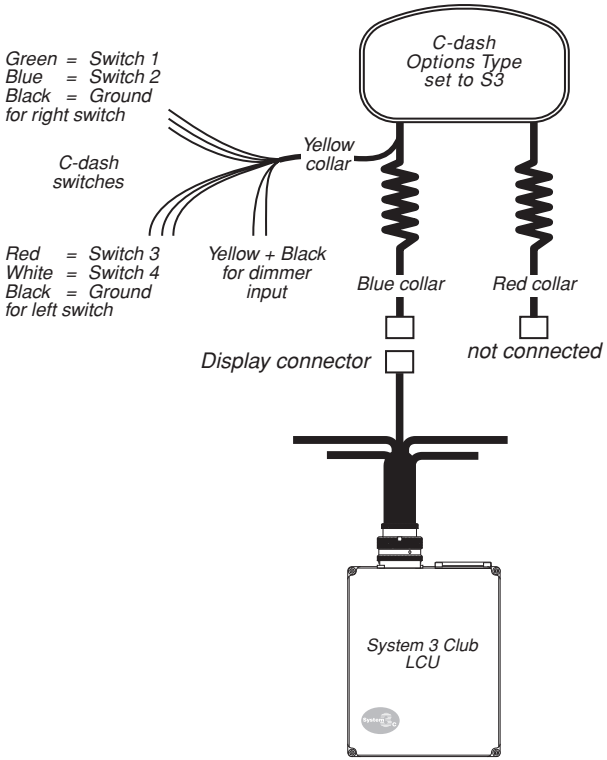
Appendix B - C-dash and System 3 Club

Introduction

The Pi C-dash can be used with Pi System 3 Club to display channel data. The channels for display on the C-dash are selected using Pi Version 6 Lite Setup software. Two remote, centre position, toggle switches are used to control the C-dash.

Installation with System 3 Club

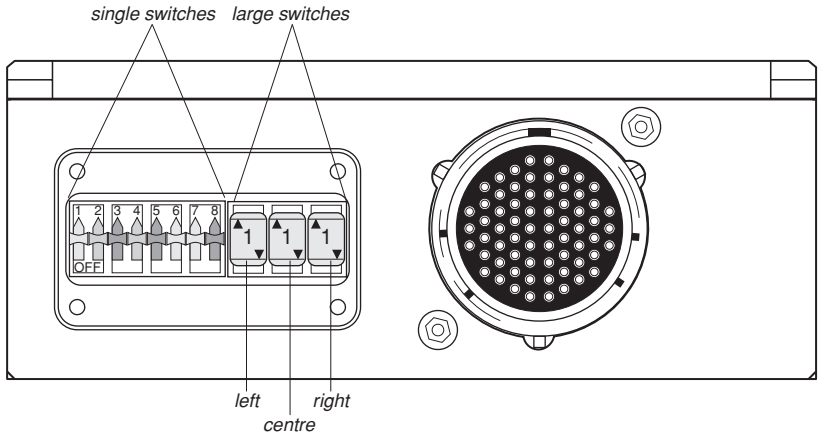
The C-dash loom with the Blue collar is connected to the Display connector on the System 3 Club loom.



Connecting a C-dash to Pi System 3 Club

System 3 Club LCU DIP switch settings

The large DIP switches on the System 3 Club LCU must be set up to use the C-dash. The left and right large switches must be set to ON (up position). Refer to the System 3 Club User Guide for the settings for the single DIP switches.



LCU DIP switch settings

Using the C-dash with System 3 Club

Display pages

Displayed information is organised in pages. There are three pages of information; race, start and practice. Channel values on these pages are grouped together, giving suitable channels for starting the engine, a minimal race setting, and a practice session. The C-dash has a default set of channels for each page, but you can change the channels that are displayed by using Pi Version 6 Lite Setup software.

You can use the C-dash to display alarms which you set up using Pi Version 6 Lite Setup software.

C-dash switches

When used with System 3 Club the C-dash has two remote, centre position, toggle switches which replace the normal red [CHANNEL] and green [MODE/LAP] push button switches used with the C-dash. You use the remote switches to change page, acknowledge alarms and activate other functions of the C-dash. The switches are either used individually, or together, increasing the number of functions they perform.

The left-hand switch is normally the Page switch and is used to change between display pages. The right-hand switch is normally the Driver's switch and is used to acknowledge alarms.

Clicking and holding a switch

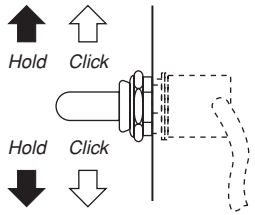
The switches are spring loaded and biased to the centre position. Each switch can be either 'clicked' or 'held'.

To click a switch:

1 Push the switch away from its central position (either up or down), for not more than one second, and release it. The switch will return to the centre position.

To hold a switch:

1 Push the switch away from its central position (either up or down) and wait until the display changes (between one and three seconds). Release the switch and it will return to the centre position.



Clicking and Holding switches

Changing pages

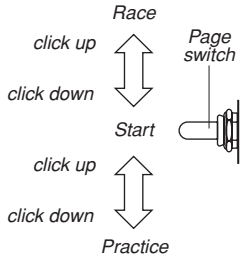
Display pages are organised in the order:

- Race page
- Start page
- Practice page

Assuming that you are looking at the Race page (the default page), to change to the Start page:

1. Click the page switch once, upwards. As you click the page switch, the C-dash display clears and Status page is shown momentarily on the display. The Status page shows the selected page and the code version that your System is programmed with.
2. To change from the start page to the practice page, click the page switch once upwards.
3. To move through the pages in the opposite direction, click the page switch once downwards for each page.

Note: The pages of the display do not scroll around.



Changing pages using the Page switch

C-dash setup for use with System 3 Club

To work with System 3 Club the C-dash must be set to be Type S3 in the Setup Options.

To set the Options Type to S3:

1. Hold both remote switches in the ON (up) position and apply power to the C-dash. This forces the C-dash into Setup mode.
2. Click the Drivers switch to cycle through the Setup Groups. Stop at **Options**.
3. Hold the Drivers switch in the ON (up) position. Click the Page switch to cycle through the options. Stop at **type**.
4. Click the Drivers switch to cycle through the types. Stop at **S3.**
5. Hold both remote switches in the ON (up) position for two seconds. The C-dash setup is saved.

Pi Version 6 Lite Setup software

You use Pi Version 6 Lite Setup software to configure the C-dash.

To configure the C-dash:

1. From the Pi Version 6 Lite Setup software **Hardware** menu choose **Display Items** or click the **Display Items** button on the toolbar. The Display Setup dialog box appears.
2. Select a car from the **Car** list.
3. In the **G Threshold for Corner Exit Speed** box enter a threshold value.
4. In the **RPM Red Line** box enter a value for the RPM Red Line.
5. Select a page from the **Page** list.
6. Click each display field button in turn and select a channel from the list.
7. Click the **Gear Display** button and configure the Gear Display Setup dialog box as required.
8. Click the **Gear Channel** button and select a channel from the list.

Note: The gear change lights and redline alarm light will not work if you don't select a channel for the Gear Channel.

9 Select a **Gear** from the list and set the RPM values for the gear change lights (LEDs 1 to 4) and RPM redline alarm (LED 5) on the C-dash.

10 If you are using satellite displays click on the relevant button in the Numeric Displays panel and select a channel to display from the list.

11 Repeat steps **5** to **10** for the other two **Pages**.

12 Click **Time Format** and select from the options in the Time Format dialog box.

13 Click **Alarms** and complete the Alarm Setup dialog box as required.

14 Click **OK**.

Appendix C - C-dash and MBE ECU

Introduction

The C-dash can display the following channels from an MBE ECU:

- Oil pressure
- Fuel pressure
- RPM
- Water temperature
- Oil temperature

External sensors required

The data stream from the ECU does not include Speed information. To enable speed to be displayed a wheelspeed input is required. To provide lap times a Beacon input is required.

C-dash setup for use with MBE ECU

The **Units** setup for oil and water temperatures are fixed at °C. The **Units** setup for fuel and oil pressure are fixed at PSI.

Set up **Alarms**, **Beacon**, **RPM**, **Wheelspeed** and **Options** as required. The **Options - Type** must be set to **MBE**.

Using a MBE ECU and C-dash with Pi System 1

The C-dash can be connected to a Pi System 1 which will then allow the MBE ECU channels to be logged. Refer to Appendix A - C-dash and System 1 for details on how to use a C-dash with System 1.

C-dash connections : MBE ECU and System 1

The MBE ECU data stream is connected pin 4 on the C-dash loom Blue connector labelled **Display**.

Pi System 1 is connected to pin 3 on the C-dash loom Blue connector labelled **Display**.

Appendix D - C-dash and Pectel ECU

Introduction

The C-dash can display the following channels from a Pectel ECU:

- Speed
- Oil pressure
- Fuel pressure
- RPM
- Gear number
- Water temperature
- Oil temperature

External sensors required

A Beacon input is required to provide lap times.

C-dash setup for use with Pectel ECU

Set up **Alarms**, **Beacon**, **RPM**, **Wheelspeed** and **Options** as required. The **Options - Type** must be set to **Pectel**.

Using a Pectel ECU and C-dash with Pi System 1

The C-dash can be connected to a Pi System 1 which will then allow the Pectel ECU channels to be logged. Refer to Appendix A - C-dash and System 1 for details on how to use a C-dash with Pi System 1.

C-dash software version requirements

To use a Pectel ECU with the C-dash and Pi System 1 the C-dash must be programmed with software version 1.41 or later. The software version is displayed during the selftest sequence when the C-dash is powered up.

C-dash connections : Pectel ECU and System 1

The Pectel ECU data stream is connected to pin 4 on the C-dash loom Blue connector labelled **Display**.

Pi System 1 is connected to pin 2 on the C-dash loom Blue connector labelled **Display**.

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